THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONCERN

METHODOLOGY

The "Affected Environment" chapter provides a description of the federal endangered, threatened, and candidate species found at Indiana Dunes National Lakeshore, including the Karner blue butterfly (*Lycaeides melissa samuelis*), Indiana bat (*Myotis sodalis*), piping plover, Pitcher's thistle, and eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*). Disturbance to these species and their habitat was evaluated by comparing projected changes resulting from implementing the action alternatives to taking no action (i.e., the no-action alternative). Impacts to piping plover and Pitcher's thistle are discussed under each of the alternative discussions below. Impacts to the Karner blue butterfly, Indiana bats, and eastern massasauga rattlesnake are summarized here.

Populations of the Karner blue butterfly do not occur within reaches 1, 2, and 3. Within Indiana Dunes National Lakeshore, there are populations that occur in reach 4 (at West Beach and in the adjacent Miller Woods), but other populations are located further inland. There would be no effect on the Karner blue butterfly under any of the alternatives for any of the reaches because the Karner blue butterfly does not occur in reaches 1, 2, and 3, and because nourishment activities in reach 3 would not affect the populations located within and adjacent to reach 4.

Indiana bats have been found within the inland Heron Rookery Unit of the park but not within reaches 1, 2, 3, and 4 where suitable habitat is unlikely to be present. There would be no effect on the Indiana bat under any of the alternatives for any of the reaches because suitable habitat for the Indiana bat does not occur in reaches 1, 2, 3, and 4.

Although sightings are rare, individual eastern massasauga rattlesnakes have been observed within suitable habitat inland. There would be no effect on the eastern massasauga rattlesnake under any of the alternatives for any of the reaches because actions implemented within the shoreline and beach complex would not affect these habitats and the eastern massasauga rattlesnake is unlikely to inhabit beach areas where nourishment would occur.

Information about the federal endangered, threatened and candidate species was compiled from site visits, research data that is publicly available, information from park staff, and studies of similar actions and effects. Impacts on the species are assessed qualitatively based on the project team's knowledge and best professional judgment.

Intensity Level Definitions

Intensity thresholds for threatened and endangered species and species of concern are defined as follows:

Negligible: The impact is barely detectable and/or would result in no noticeable or perceptible changes in the protection of threatened and endangered species and species of concern.

Minor: The impact is slight but detectable and/or would result in small but noticeable changes in the protection of threatened and endangered species and species of concern.

Moderate: The impact is readily apparent and would result in easily detectable changes in the protection of threatened and endangered species and species of concern.

Major: The impact is severely adverse or exceptionally beneficial, and/or would result in appreciable changes in the protection of threatened and endangered species and species of concern.

SHORELINE AND BEACH COMPLEX, REACHES 1 AND 2

Alternative A (No-action Alternative)

Under the no-action alternative, no new actions would be taken in the park in regards to threatened and endangered species and species of concern and their habitat. Under this alternative, reaches 1 and 2 would continue to experience erosion, beach loss, and degradation of the foredune and dune complex. Moderate, short-term, adverse impacts would result under alternative A from continued erosion, loss of habitat for piping plover and Pitcher's thistle, and the continued sediment budget deficit that would impact habitat for threatened and endangered species. Restoration of habitat for the Pitcher's thistle, and possibly the piping plover, which do not currently occur in reaches 1 and 2, would be unlikely under the no-action alternative. Therefore, under the no-action alternative these species may be affected, and are likely to be adversely affected, because development of future habitat is not addressed and substantial erosion would be likely to continue.

Cumulative Impacts. Several actions, independent of this plan, would affect the park's threatened and endangered species and species of concern. As described in the "Affected Environment" chapter, the unique environment at Indiana Dunes National Lakeshore provides a mosaic of habitats for terrestrial plants and wildlife in a relatively small area.

Independent of this plan, park staff would continue to monitor and protect threatened and endangered species and species of concern in the park to the greatest extent possible. Education and outreach activities, and other actions such as the realignment of some trails in the park, would have negligible to minor, long-term, beneficial effects on these species due to reduced anthropogenic influences. Habitat critical for the preservation of threatened and endangered species and species of concern would thus be maintained.

Additionally, restoration efforts by the park to preserve the foredune and dune complex (such as fencing off highly eroded areas and revegetating eroded areas with native plants) and to stabilize highly eroded areas would have negligible to minor, long-term, beneficial impacts on threatened and endangered species and species of concern by restoring the natural environment/habitat for such plants and animals.

Current and proposed development in and around the park, like that which occurred under Phase I of the Marquette Plan and that which is proposed under Phase II of that plan, would have minor, long-term, adverse impacts on threatened and endangered species and species of concern from the removal of habitat for these species, and minor, short-term, adverse impacts from the destruction of habitat during construction and the time it takes for species to colonize and re-emerge.

Activities or projects that would introduce new sound sources into the park, like construction and special events, such as the annual Super Boat Grand Prix boat race, would have negligible to minor, short-term, adverse effects on threatened and endangered species and species of concern. These effects, however, would be temporary, lasting only as long as construction or the duration of the special event.

Overall, when the actions described above are added to the existing threatened and endangered species and species of concern scenario, there would be negligible to minor, short- and long-term, adverse and beneficial cumulative impacts. The actions under alternative A would add a small increment to the overall cumulative impact.

Conclusion. Under the no-action alternative, the Pitcher's thistle and piping plover (which are threatened and endangered species may be affected, and are likely to be adversely affected, because loss of historical habitat is

not addressed adequately and substantial erosion would likely continue under this alternative. Moderate, short-term, adverse impacts would result under alternative A from continued erosion, loss of habitat for piping plover and Pitcher's thistle, and the continued sediment budget deficit that would impact habitat for threatened and endangered species and species of concern. Cumulatively, there would be negligible to minor, short- and long-term, adverse and beneficial impacts. The actions under alternative A would result in a small increment being added to the overall cumulative impact.

Alternative B-1 (Beach Nourishment via Upland Sources, Annual Frequency)

Currently, there is no habitat within reach 1 for Pitcher's thistle and piping plover; however, there would be the potential for such habitat to be restored as a result of the beach nourishment proposed under alternative B-1. Therefore, under alternative B-1, there would be moderate to major, short- and long-term, beneficial impacts on these species from habitat restoration, and minor, short-term, adverse impacts as the placement of nourishment material would temporarily disturb the ability of piping plover to nest and Pitcher's thistle to establish. The actions associated with alternative B-1 would affect, but are not likely to adversely affect, the Pitcher's thistle and piping plover (threatened and endangered species.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative B-1. Compared to the cumulative impacts expected under the no-action alternative, under alternative B-1, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. The actions associated with alternative B-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative B-1, there would be moderate to major, short-term, beneficial impacts on Pitcher's thistle and piping plover (threatened and endangered species, from the habitat restoration that would result from the expanded beach nourishment activities. The implementation of alternative B-1 would also result in minor, short-term, adverse impacts on threatened and endangered species and species of concern as placement of nourishment material from upland sources would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish. With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect these species. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, and adverse and beneficial cumulative effects.

Alternative B-5 (Beach Nourishment via Upland Sources, Five-Year Frequency)

Similar to alternative B-1, there would be the potential for habitat to be restored under alternative B-5 for Pitcher's thistle and piping plover because of the additional beach nourishment that would occur under this alternative. Therefore, under alternative B-5, there would be moderate to major, long-term, beneficial impacts on these species from habitat restoration. Due to the longer placement period (approximately 18 months every five years), there would also be minor to moderate, long-term, adverse impacts from

the placement of nourishment material that would disturb the ability of piping plover to nest and Pitcher's thistle to establish. The actions associated with alternative B-5 would affect, but are not likely to adversely affect, Pitcher's thistle and piping plover (threatened and endangered species.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative B-5. Compared to the cumulative impacts expected under the no-action alternative, under alternative B-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. The actions associated with alternative B-5 would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under alternative B-5, there would be moderate to major, long-term, beneficial impacts on Pitcher's thistle and piping plover from the habitat restoration that would result from the expanded beach nourishment activities. The implementation of alternative B-5 would also result in minor to moderate, long-term, adverse impacts on these species as placement of nourishment material from upland sources would disturb the ability of piping plover to nest and for Pitcher's thistle to establish. With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect these species. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, and adverse and beneficial cumulative effects.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency)

Like the other action alternatives in reaches 1 and 2, under alternative C-1 there would be the potential for Pitcher's thistle and piping plover habitat to be restored because of the additional beach nourishment that would occur via dredging. Therefore, under alternative C-1, there would be moderate to major, short- and long-term, beneficial impacts on these species from habitat restoration, and minor, short-term, adverse impacts from the placement of nourishment material that would temporarily disturb the ability of piping plover to nest and Pitcher's thistle to establish. The actions associated with alternative C-1 would affect, but are not likely to adversely affect, threatened and endangered species and species of concern.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-1. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-1, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. The actions associated with alternative C-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-1, there would be moderate to major, short-term, beneficial impacts on threatened and endangered species and species of concern from the habitat restoration that would result from the expanded beach nourishment activities. The implementation of alternative C-1 would also result in minor, short-term, adverse impacts on threatened and endangered species and species of concern as placement of nourishment material would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish. With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect these species. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, and adverse and beneficial cumulative effects.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency)

Similar to alternative C-1, there would be the potential for habitat to be restored under alternative C-5 for Pitcher's thistle and piping plover because of the additional beach nourishment that would occur via dredging. Therefore, under alternative C-5, there would be moderate to major, long-term, beneficial impacts on these species from habitat restoration. Due to the longer placement period (approximately 10 months every five years), there would also be minor to moderate, short-term, adverse impacts from the placement of nourishment material that would disturb the ability of piping plover to nest and Pitcher's thistle to establish. The actions associated with alternative C-5 would affect, but are not likely to adversely affect, threatened and endangered species and species of concern.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-5. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. The actions associated with alternative C-5 would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-5, there would be moderate to major, long-term, beneficial impacts on Pitcher's thistle and piping plover from the habitat restoration that would result from the expanded beach nourishment activities. The implementation of alternative C-5 would also result in minor to moderate, short-term, adverse impacts on these species as placement of nourishment material would disturb the ability of piping plover to nest and for Pitcher's thistle to establish. With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect these species. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, and adverse and beneficial cumulative effects.

Alternative D (Beach Nourishment via Permanent Bypass System)

Like the other action alternatives in reaches 1 and 2, under alternative D, there is the potential for Pitcher's thistle and piping plover habitat to be restored because of the additional beach nourishment that would occur via a permanent bypass system. Therefore, under alternative D, there would

be moderate to major, short-term, beneficial impacts on these species from habitat restoration, and minor, short-term, adverse impacts from the placement of nourishment material that would temporarily disturb the ability of piping plover to nest and Pitcher's thistle to establish. The actions associated with alternative D would affect, but are not likely to adversely affect, Pitcher's thistle and piping plover (threatened and endangered species. Coupled with site restoration, the Pitcher's thistle and piping plover would be likely to benefit as a result of habitat improvements under alternative D.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative D. Compared to the cumulative impacts expected under the no-action alternative, under alternative D, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. The actions associated with alternative D would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative D, there would be moderate to major, short-term, beneficial impacts on threatened and endangered species and species of concern from the habitat restoration that would result from the expanded beach nourishment activities via the permanent bypass system that would be constructed. The implementation of alternative D would also result in minor, short-term, adverse impacts on threatened and endangered species and species of concern as placement of nourishment material would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish. With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect these species. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have negligible to minor, short- and long-term, and adverse and beneficial cumulative effects.

Alternative E (Submerged Cobble Berm and Beach Nourishment, Annual Frequency)

Under alternative E, there is the potential for Pitcher's thistle and piping plover habitat to be restored because of the additional beach nourishment and greater sediment retention that would occur with the use of a submerged cobble berm in conjunction with a beach nourishment program. Therefore, under alternative E, there would be major, long-term, beneficial impacts on these species from habitat restoration, and minor, short-term, adverse impacts from the placement of the submerged cobble berm that would temporarily disturb the ability of piping plover to nest and Pitcher's thistle to establish. The actions associated with alternative E would affect, but are not likely to adversely affect, threatened and endangered species and species of concern. Coupled with site restoration, the Pitcher's thistle and piping plover would benefit as a result of habitat improvements under alternative E.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative E. Compared to the cumulative impacts expected under the no-action alternative, under alternative E, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Beneficial impacts would result from the restoration of habitat

for threatened and endangered species and species of concern. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. The actions associated with alternative E would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under alternative E, there would be major, long-term, beneficial impacts on Pitcher's thistle and piping plover from the habitat restoration that would result from the placement of the submerged cobble berm. The implementation of alternative E would also result in minor, short-term, adverse impacts on threatened and endangered species and species of concern as placement of nourishment material would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish. With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect these species. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, and adverse and beneficial cumulative effects.

Alternative F (Beach Nourishment, Annual Frequency with a Mix of Small Natural Stone at the Shoreline) – Preferred Alternative

Under alternative F, Pitcher's thistle and piping plover habitat would be restored because of the beach nourishment program that would include a mix of coarse upland material and small natural stone. Therefore, under alternative F, there would be major, long-term, beneficial impacts on these species from habitat restoration, and minor, short-term, adverse impacts from the placement of the sediment and native stone mix that would temporarily disturb the ability of piping plover to nest and Pitcher's thistle to establish. The actions associated with alternative F would affect, but are not likely to adversely affect, threatened and endangered species and species of concern. Coupled with site restoration, the Pitcher's thistle and piping plover would benefit as a result of habitat improvements under the preferred alternative.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative F. Compared to the cumulative impacts expected under the no-action alternative, under the preferred alternative, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. The actions associated with alternative F would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under the preferred alternative, there would be major, long-term, beneficial impacts on Pitcher's thistle and piping plover from the habitat restoration that would result from the additional beach nourishment and greater sediment retention. The implementation of alternative F would also result in minor, short-term, adverse impacts on threatened and endangered species and species of concern as placement of the beach nourishment mix would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish. With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect, these species. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short-

and long-term, and adverse and beneficial cumulative effects.

SHORELINE AND BEACH COMPLEX, REACHES 3 AND 4

Alternative A (No-action Alternative)

Like the no-action alternative in reaches 1 and 2, no new actions would be taken in the park in regards to threatened and endangered species and species of concern and their habitat under alternative A in reaches 3 and 4. Under this alternative, reaches 3 and 4 would continue to experience erosion, beach loss, and degradation of the foredune and dune complex. Moderate, short-term, adverse impacts would result under alternative A from continued erosion, loss of habitat for piping plover and Pitcher's thistle, and the continued sediment budget deficit that would impact habitat for threatened and endangered species and species of concern. Restoration of habitat for the Pitcher's thistle, and possibly the piping plover, would be unlikely under the no-action alternative. Therefore, under the no-action alternative these species may be affected, and are likely to be adversely affected, because loss of historical habitat would not be addressed adequately and substantial erosion would continue.

Cumulative Impacts. Several actions, independent of this plan, would affect the park's threatened and endangered species and species of concern. Independent of this plan, park staff would continue to monitor and protect threatened and endangered species and species of concern in the park to the greatest extent possible. Education and outreach activities, and other actions, such as the realignment of some trails in the park, would have negligible to minor, long-term, beneficial effects on these species due to reduced anthropogenic influences. Habitat critical for the preservation of threatened and endangered species and species of concern would thus be maintained.

Additionally, restoration efforts by the park to preserve the foredune and dune complex (such as fencing off highly eroded areas and revegetating eroded areas with native plants) and to stabilize highly eroded areas would have negligible to minor, long-term, beneficial impacts on threatened and endangered species and species of concern by restoring the natural environment/habitat for such plants and animals.

Current and proposed development in and around the park, like that which occurred under Phase I of the Marquette Plan and that which is proposed under Phase II of that plan, would have minor, long-term, adverse impacts on threatened and endangered species and species of concern from the removal of habitat for these species, and minor, short-term, adverse impacts from the destruction of habitat during construction and the time it takes for species to colonize and re-emerge. Activities or projects that would introduce new sound sources into the park, like construction and special events, such as the annual Super Boat Grand Prix boat race, would have negligible to minor, short-term, adverse effects on threatened and endangered species and species of concern. These effects, however, would be temporary, lasting only as long as construction or the duration of the special event.

Overall, when the actions described above are added to the existing threatened and endangered species and species of concern scenario, there would be negligible to minor, short- and long-term, adverse and beneficial cumulative impacts. The actions under alternative A would add a small increment to the overall cumulative impact.

Conclusion. Under the no-action alternative, the threatened and endangered species, Pitcher's thistle and piping plover, may be affected, and are likely to be adversely affected, because loss of historical habitat is not addressed adequately and substantial erosion would continue under this alternative. Moderate, short-term, adverse impacts would result under alternative A from continued

erosion, loss of habitat for piping plover and Pitcher's thistle, and the continued sediment budget deficit that would impact habitat for threatened and endangered species and species of concern. Cumulatively, there would be negligible to minor, short- and long-term, adverse and beneficial impacts. The actions under alternative A would result in a small increment being added to the overall cumulative impact.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency) – Preferred Alternative

Under alternative C-1, the preferred alternative in reaches 3 and 4, there would be the potential for Pitcher's thistle and piping plover habitat to be restored because of the additional beach nourishment that would occur via dredging. Under alternative C-1, there would be moderate to major, short-term, beneficial impacts on the threatened and endangered species, Pitcher's thistle and piping plover, from the habitat restoration that would result from the expanded beach nourishment activities. There would also be minor, short-term, adverse impacts as placement of nourishment material would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish. Critical habitat for the piping plover is located within the eastern terminus of reach 3, as well as near the water intake operated by NIPSCO. Mining of sediment to be placed on the beach in reach 3 would occur via dredging around the NIPSCO intake, lakeward of the piping plover habitat. The annual dredging operations would not directly disturb the piping plover habitat, though the sound generated from this process would have an indirect effect if conducted during the migration and nesting season (though work would be conducted outside critical periods [such as nesting] for the specific species when possible, and work in areas in or near suitable threatened and endangered bird habitat would occur as late as possible in the summer/fall). With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect these species. No adverse modification of the piping plover critical habitat would occur under this alternative. Overall, the actions associated with alternative C-1 would affect, but are not likely to adversely affect, Pitcher's thistle and piping plover (threatened and endangered species).

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-1 in reaches 3 and 4. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-1, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. The actions associated with alternative C-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-1, there would be moderate to major, short-term, beneficial impacts on threatened and endangered species and species of concern from the habitat restoration that would result from the expanded beach nourishment activities. There would also be minor, short-term, adverse impacts to threatened and endangered species and species of concern as placement of nourishment material would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish. Coupled with beach nourishment, dredging would not be an adverse modification to the piping plover habitat under alternative C-1. No adverse modification of the piping plover critical habitat would occur under this

alternative. The actions associated with alternative C-1 would affect, but are not likely to adversely affect, Pitcher's thistle and piping plover (threatened and endangered species). This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, and adverse and beneficial cumulative effects.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency)

The actions and impacts under alternative C-5 would be similar to those described under alternative C-1 for reaches 3 and 4, except that the nourishment activities would take longer (approximately six months every five years). Under alternative C-5 there would be the potential for Pitcher's thistle and piping plover habitat to be restored because of the additional beach nourishment that would occur via dredging, and there would be moderate to major, long-term, beneficial impacts on threatened and endangered species and species of concern from this. There would also be minor, short-term, adverse impacts as placement of nourishment material would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish.

Under alternative C-5, sediment would be dredged from an updrift location in Lake Michigan, such as near the NIPSCO/Bailly intake, lakeward of the piping plover habitat. The annual dredging operations would not directly disturb the piping plover habitat, though the sound generated from this process would have an indirect effect if conducted during the migration and nesting season (though work would be conducted outside critical periods [such as nesting] for the specific species when possible, and work in areas in or near suitable threatened and endangered bird habitat would occur as late as possible in the summer/fall). With respect to the Pitcher's thistle and piping plover, this alternative may affect, but is not likely to adversely affect these species. No adverse modification of the piping plover critical habitat would occur under this alternative.

The actions associated with alternative C-1 would affect, but are not likely to adversely affect, Pitcher's thistle and piping plover (threatened and endangered species).

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-5. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. The actions associated with alternative C-5 would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-5, there would be moderate to major, long-term, beneficial impacts on threatened and endangered species and species of concern from the habitat restoration that would result from the expanded beach nourishment activities. There would also be minor, short-term, adverse impacts as placement of nourishment material would temporarily disturb the ability of piping plover to nest and for Pitcher's thistle to establish. Coupled with beach nourishment, dredging would not be an adverse modification to the piping plover habitat under alternative C-5. No adverse modification of the piping plover critical habitat would occur under this alternative, and the actions associated with alternative C-5 would affect, but are not likely to adversely

affect, these threatened and endangered species. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, and adverse and beneficial cumulative effects.

Alternative D (Beach Nourishment via Permanent Bypass System)

The actions and impacts under alternative D would be similar to those described under alternative C-1 for reaches 3 and 4, except that nourishment would be conducted via a permanent bypass system for sediment transport. Like the other action alternatives proposed for reaches 3 and 4, there is the potential for Pitcher's thistle and piping plover habitat to be restored because of the additional beach nourishment that would occur, resulting in moderate to major, short-term beneficial impacts on these threatened and endangered species from the habitat restoration that would result. The continuation of sediment placement in this reach would be of benefit to the Pitcher's thistle and piping plover. Habitat restoration at an increased level of beach nourishment would occur. The actions associated with alternative D would result in minor, short-term, adverse impacts from placement activities, and may affect, but are not likely to adversely affect these species as placement of the nourishment material may temporarily disturb the ability for piping plover to nest and for Pitcher's thistle to establish. Work would be conducted outside critical periods (such as nesting) for the specific species when possible. In addition, work in areas in or near suitable threatened and endangered bird habitat would occur as late as possible in the summer/fall.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative D. Compared to the cumulative impacts expected under the no-action alternative, under alternative D, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor to moderate, short- and long-term, and adverse and beneficial. Adverse impacts would result from the temporary disturbance to habitat for threatened and endangered species and species of concern during placement activities, affecting the ability of some species to nest and establish. Beneficial impacts would result from the restoration of habitat for threatened and endangered species and species of concern. The actions associated with alternative D would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative D, habitat loss would diminish and the possibility of the establishment of a natural ecosystem would be likely, resulting in moderate to major, short-term, beneficial impacts. The continuation of sediment placement in this reach would be of benefit to the Pitcher's thistle and piping plover. Habitat restoration at an increased level of beach nourishment would occur. The actions associated with alternative D would result in minor, short-term, adverse impacts during placement activities, and may affect, but are not likely to adversely affect these species. Coupled with beach nourishment, a permanent bypass system would not be an adverse modification to the piping plover habitat. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, and adverse and beneficial cumulative effects.

FOREDUNE AND DUNE COMPLEX, REACHES 1 THROUGH 4

Current Management Actions

The current management actions described in "The Alternatives" chapter for the foredune and dune complex have multiple impacts on threatened and endangered species and species of concern. Ongoing beach nourishment activities in reaches 1 and 3

provide a minor, short-term, beneficial impact on threatened and endangered species and species of concern by preventing erosion, thus protecting critical habitat for these species. Placement activities also result in negligible to minor, short-term, adverse effects from the temporary disruption of habitat to these species during these activities.

Current management efforts to maintain, protect, and restore eroding areas (such as fencing off highly eroded areas and revegetating with native plants) in the park have minor, long-term, beneficial impacts on threatened and endangered species and species of concern from the preservation and restoration of critical habitat for these species. Activities related to these efforts have negligible to minor, short-term, adverse effects that last only as long as construction/maintenance work from the temporary disruption to critical habitat.

Invasive vegetation management in the park has minor, long-term, beneficial impacts on threatened and endangered species and species of concern from the restoration of critical habitat for these species, although there are negligible to minor, short-term, adverse effects during activities related to revegetation and management efforts that result from the temporary disruption of habitat for these species.

Education and outreach activities that help limit anthropogenic influences in the park have negligible to minor, long-term, beneficial impacts on threatened and endangered species and species of concern by preserving their habitat and reducing their exposure to outside influences.

By preserving existing ecological conditions through sustaining natural coastal processes, the National Park Service is providing a negligible to minor, long-term, beneficial effect on the threatened and endangered species and species of concern within the park, particularly piping plover and existing populations of Pitcher's thistle.

Proposed Management Actions

The proposed management actions are described in "The Alternatives" chapter. The park proposes to continue with the current management actions described above, having a negligible to minor, long-term, beneficial impact on threatened and endangered species and species of concern by increasing the potential for these species to find suitable habitat in the park and to inhabit the park.

Cumulative Impacts. Ongoing planned facility upgrades and proposed new developments in the park (such as those proposed under Phase II of the Marquette Plan) would have minor to moderate, short-term, adverse impacts on threatened and endangered species and species of concern from the sound that construction-related activities would bring in to the park that could temporarily displace threatened and endangered species and species of concern during construction and from the temporary disturbance to habitat during these activities. Special events near the park, like the Super Boat Grand Prix, would have negligible to minor, short-term, adverse impacts on threatened and endangered species and species of concern from the increase in sound in the park during such activities, and from the increase in anthropogenic influences (e.g., native vegetation trampling and increased numbers of social trails) that typically result during and after increased visitorship periods.

Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under threatened and endangered species and species of concern as a result of proposed management actions would be negligible, long-term, and beneficial as a result of increasing the potential for these species to find suitable habitat in the park and to inhabit the park over the long term.

Conclusion. Impacts on the foredune and dune complex in reaches 1 through 4 under threatened and endangered species and species of concern as a result of proposed management actions would be negligible to

minor, long-term, and beneficial from actions being taken to increase the potential for these species to find suitable habitat in the park and to inhabit the park. Ongoing planned facility upgrades and proposed new developments in the park would have minor to moderate, short-term, adverse impacts on threatened and endangered species and species of concern from the sound that construction-related activities would bring in to the park that could temporarily displace threatened and endangered species and species of concern during construction and from the temporary disturbance to habitat during these activities. Special events near the park, like the Super Boat Grand Prix, would have negligible to minor, short-term, adverse impacts on threatened and endangered species and species of concern from the increase in sound in the park during such activities, and from the increase in anthropogenic influences that typically result during and after increased visitorship periods. Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under threatened and endangered species and species of concern as a result of proposed management actions would be negligible, long-term, and beneficial.

WETLANDS AND PANNES

METHODOLOGY

As explained in the "Affected Environment" chapter, there are two wetland features specific to Indiana Dunes National Lakeshore, the aquatic and panne communities. Impacts on wetlands and pannes were evaluated by comparing projected changes resulting from implementing the action alternatives to taking no action (i.e., the no-action alternative).

Information about the park's wetlands and pannes was compiled from site visits, research data that is publicly available, information from park staff, and studies of similar actions and effects. Impacts on wetlands and pannes were assessed qualitatively based on the project team's knowledge and best professional judgment.

Intensity Level Definitions

Intensity thresholds for wetlands and pannes are defined as follows:

Negligible: The impact is barely detectable and/or would result in no noticeable or perceptible changes to wetlands and pannes in the park.

Minor: The impact is slight but detectable and/or would result in small but noticeable changes to wetlands and pannes in the park.

Moderate: The impact is readily apparent and would result in detectable changes to wetlands and pannes in the park.

Major: The impact is severely adverse or exceptionally beneficial, and/or would result in appreciable changes to wetlands and pannes in the park.

SHORELINE AND BEACH COMPLEX, REACHES 1 THROUGH 4

The entire shoreline at Indiana Dunes National Lakeshore is classified as a wetland. Under the no-action alternatives and action alternatives for all reaches, the shoreline would remain un-vegetated beach wetland communities. Under the current nourishment activities taking place under the no-action alternative, as well as under the actions that would take place under the action alternatives for all reaches, temporary impacts to the beach wetlands would result from the placement of nourishment material directly on the beach. However, there would be a benefit to the wetland habitat as a result of the nourishment activities, including continued maintenance of the sediment required to sustain the un-vegetated beach wetland habitat. Natural ecological processes would function as they did prior to disturbance, to the extent practicable. No wetlands outside of the project area would be adversely impacted, resulting in no-net-loss of wetlands. This meets the NPS "no-net-loss of wetlands" policy as stated in NPS Director's Order 77-1: *Wetland Protection* and *Procedural Manual #77-1*. Under the action alternatives, the resulting shoreline (post-restoration) would be the same acreage of the same wetland type as currently exists, either maintained in its present position or shifted northward because a comparable shoreline profile would develop. As such, the project would be considered under the Restoration Exception in Section 4.2.1(h) of NPS Director's Order 77-1 and would be an excepted action. A Wetland Statement of Findings would not need to be prepared. There would be no incremental or cumulative effects on wetlands because the project would not affect the overall acreage or type of wetlands either within or outside of the project area.

FOREDUNE AND DUNE COMPLEX, REACHES 1 THROUGH 4

Current Management Actions

As explained in "The Alternatives" chapter, there are various current management actions taking place in the reaches of Indiana Dunes National Lakeshore that impact wetlands and pannes in reaches 1, 3, and 4 (reach 2 has no wetlands or pannes). These include the ongoing beach nourishment activities that take place on an intermittent basis in reaches 1 and 3. Such beach nourishment activities help prevent erosion and protect the existence of wetlands and pannes, having a negligible to minor, short-term, beneficial impact on these resources.

At blowout locations in the park, invasive plant management is performed to help protect Pitcher's thistle populations, having a negligible to minor, long-term, beneficial effect on these populations and the wetlands and pannes in areas that surround them. In addition, invasive nonnative plant species management, which include the early detection and rapid response program and Invasive Plant Management Plan, in other areas of the park (such as West Beach and Miller), help preserve the pannes (the foredune complex at Miller is interrupted by leeward pannes and aquatic plant communities and West Beach has the largest concentration of high quality pannes in the project area). These activities have negligible to minor, long-term, beneficial effects on wetlands and pannes, as do measures that are taken by the park to manage anthropogenic influences in the reaches, such as fencing and visitor outreach and education (West Beach is one of the most popular and highly visited entry points in the park with numerous social trails extending from the parking lots to the beach that traverse through sensitive habitat within the foredune and dune complex). Outreach and education create visitor awareness of the impacts of invasive nonnative plant species and anthropogenic influences in the park.

Current restoration and resource protection projects in the park, such as the early detection and rapid response program and Invasive Plant Management Plan and revegetation with native seeds, have minor, long-term, beneficial impacts on wetlands and pannes from the early detection and eradication of such species.

Proposed Management Actions

As explained in "The Alternatives" chapter, there are multiple proposed management actions for Indiana Dunes National Lakeshore that would impact wetlands and pannes in reaches 1, 3, and 4. If the park proceeds with expanding their education and outreach efforts, there would be negligible to minor, long-term, beneficial impacts on wetlands and pannes from the increased visitor awareness of these sensitive areas. In addition, should the park proceed with realigning some trails in the park, there would be negligible to minor, long-term, beneficial impacts on wetlands and pannes from the reduction in anthropogenic influences in these resource areas. Similarly, future actions by the park to restore the foredune and dune complex by stabilizing eroded dunes with native vegetation and fencing off highly eroded and environmentally sensitive areas on the foredune to allow for ecological recovery of natural communities would have minor, long-term, beneficial impacts on wetlands and pannes by preserving their natural environment.

Cumulative Impacts. Proposed development projects, like those included in Phase II of the Marquette Plan (IDNR *et al.* 2005), would have negligible, short-term, adverse impacts on wetlands and pannes from disruption to these sensitive landforms during construction activities. Development in the park would also have minor, long-term, adverse impacts from the take of some of these lands that would be required to build the proposed developments.

Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under wetlands and pannes as a result of proposed

management actions would be negligible to minor, long-term, and beneficial from the actions proposed to educate visitors on anthropogenic influences on wetlands and pannes and from protection and restoration measures that would be taken for these environmentally sensitive areas.

Conclusion. Impacts on the foredune and dune complex in reaches 1 through 4 under wetlands and pannes as a result of proposed management actions would be negligible to minor, long-term, and beneficial from the park expanding its education and outreach efforts, increasing visitor awareness of these sensitive areas. In addition, realigning some trails in the park would have negligible to minor, long-term, beneficial impacts on wetlands and pannes from the reduction in anthropogenic influences in these resource areas. Actions to restore the foredune and dune complex by stabilizing eroded dunes with native vegetation and fencing off highly eroded and environmentally sensitive areas on the foredune to allow for ecological recovery of natural communities would have minor, long-term, beneficial impacts on wetlands and pannes by preserving their natural environment. Proposed development projects would have negligible, short-term, adverse impacts on wetlands and pannes from disruption to these sensitive landforms during construction activities; such development would also have minor, long-term adverse impacts from the take of some of these lands that would be required to build the proposed developments. Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under terrestrial habitat as a result of proposed management actions would be negligible to minor, long-term, and beneficial.

SOUNDSCAPE

METHODOLOGY

As explained in the "Affected Environment" chapter, the soundscape of Indiana Dunes National Lakeshore includes both the human and natural environment. The sound environment of the park changes seasonally. Visitors perceive the soundscape subjectively and typically seek out areas of the park where they can either experience the natural quiet or areas where human-generated sounds dominate, depending on their personal preference. Impacts to the soundscape under each alternative were analyzed to assess how the actions associated with each would help identify a series of management actions that could be implemented by park staff, as needed, to provide a balance between protection of the shoreline ecosystem and appropriate visitor enjoyment of the park. The National Park Service's Director's Order 47: *Preservation and Noise Management* defines noise as "an unwanted or undesired sound, often unpleasant in quality, intensity or repetition. This makes noise a subjective term and pushes society to address which sounds or aspects of sound constitute unwanted interruptions in specific situations. Noise is often a byproduct of desirable activities or machines. In a national park setting, noise is a subset of human-made noise." For purposes of this plan / final EIS, soundscape and natural sounds apply to the environment; noise is only referred to in discussions of impacts. Information about the soundscape at Indiana Dunes National Lakeshore was compiled from data from park staff and studies of similar actions and effects. Soundscape impacts were assessed quantitatively and qualitatively for this resource, based on the project team's knowledge and best professional judgment.

Intensity Level Definitions

Intensity thresholds of visitor experience are defined as follows:

Negligible: The impact is barely detectable and/or would result in no noticeable or perceptible changes in the soundscape of the park.

Minor: The impact is slight but detectable and/or would result in small but noticeable changes in the soundscape of the park.

Moderate: The impact is readily apparent and would result in easily detectable changes in the soundscape of the park.

Major: The impact is severely adverse or exceptionally beneficial, and/or would result in appreciable changes in the soundscape of the park.

SHORELINE AND BEACH COMPLEX, REACHES 1 AND 2

Alternative A (No-action Alternative)

Under the no-action alternative, there would be no changes to the park's soundscape. The current beach nourishment program at the park includes sediment being placed along the shoreline at Crescent Dune from a permitted upland borrow site. This sediment is deposited on an intermittent basis and is graded along the beach with minimal equipment, having a minor, short-term, adverse impact from the noise that's generated during placement and grading activities. Under the no-action alternative, there would be no new impacts on the soundscape.

Cumulative Impacts. Current human and natural sound from inside and outside the park has affected the natural soundscape of Indiana Dunes National Lakeshore in the past, and would continue to do so in the future. The park experiences sound intrusions from various transportation corridors, including the roads that run through and around the park; such sound intrusions have

negligible, long-term, adverse effects on the soundscape since the park is surrounded by substantial development and industry. The park also experiences sound intrusions from existing industry development; for example, NIPSCO operations produce rhythmic mechanical industrial sounds that have negligible, long-term, adverse impacts on the sound environment at the park from ongoing, routine operations.

Just as the soundscape at the park varies by season and high-use times (i.e., holidays and weekends), the soundscape also varies with events. The Super Boat Grand Prix, a Michigan City sponsored event that has taken place the past three years, adds to the existing soundscape setting under the no-action alternative with minor, short-term, adverse impacts that are temporary, lasting as long as event set up, event run, and event take down. These impacts result from the increased number of boats operating in the lake, the increased number of visitors in the park during the event, and the addition of event sponsors and staff commuting to and from and being in the park to run the event.

The Northern Indiana Commuter Transportation District (the South Shore Railroad), which currently traverses the park, incrementally adds minor, long-term, adverse effects to the natural soundscape in the park from the sounds generated during daily operation of the train.

Should any of the proposed development or construction in or around the park take place (see the "Cumulative Impacts Scenario" section for a listing of the development projects proposed under the Marquette Plan) (IDNR *et al.* 2005), there would be an incremental addition of minor, short-term, adverse effects on the soundscape from the sound that would be generated from the related construction activities, including the operation of construction equipment.

Ongoing restoration, preservation, and invasive vegetation management work in the park incrementally add only negligible to minor, short-term, adverse effects on the existing soundscape, since this work is routine and cyclic, and already part of the existing soundscape at the park.

It is possible in the future that those events outside the boundaries of the park, such as recreational boating, would generate substantial sounds that would be heard in the park. New developments adjacent to the park would also result in sound generation during and after construction in these areas. These actions would incrementally add to the existing soundscape with negligible to minor, short- and long-term, adverse impacts during construction and associated daily living/operational activities.

Overall, if the actions described above were added to the existing soundscape, there would be negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape. The actions under alternative A would add a small increment to the overall cumulative impact.

Conclusion. Under alternative A, there would be minor, short-term, adverse impacts from beach nourishment activities related to sound generated from the trucks hauling the sediment and the sediment being graded along the shoreline. No new impacts on the existing soundscape in reaches 1 and 2 would result under this alternative since no new actions would be taken. Cumulatively, there would be negligible to minor, short- and long-term, adverse impacts on the natural soundscape from the sounds associated with special events, construction/development projects, and restoration and preservation work. The actions under alternative A would result in a very small increment being added to the overall cumulative impact.

Alternative B-1 (Beach Nourishment via Upland Sources, Annual Frequency)

Under alternative B-1, beach nourishment material would be mined and placed on the

beach each year at Crescent Dune from a permitted upland source by trucks traveling along an existing access road. As many as five bulldozers would be employed to distribute the sediment along the beach. The beach nourishment activities would occur over approximately four months every year in off-peak months, if possible. The beach construction area would be closed to visitors during this time. These actions associated with alternative B-1 would result in negligible to minor, short-term, adverse impacts on the soundscape in the park.

Ambient daytime noise levels within reach 1 may range from 30 A-weighted decibels (dB[A]) in areas away from human activities to 60 dBA near areas of greater human activity, such as the Michigan City Marina to the east and Lakefront Drive to the west. Under alternative B-1, up to 80 trucks per eight-hour day, five days per week, would deliver sediment to reach 1, and as many as five bulldozers would be actively moving sediment toward the western portion of the reach. Depending on the age and condition of the construction equipment, noise levels from a large diesel truck would range up to near 90 dBA at a distance of 50 feet, while the bulldozer sound level would range up to 95 dBA at a distance of 50 feet (EPA 1971). Sound intensity attenuates with distance as it propagates over a larger area, generally in a spherical spreading pattern, away from a stationary noise source, or "point source" where the sound waves were generated. Generally speaking, noise generated by a point source decreases by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water), and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of distance. Visitors would experience near ambient daytime noise levels within the nearby open beach areas because visitors would be excluded from the beach areas where nourishment activities would take place. Visitors would continue to experience the natural sound environment in the park that exists under the no-action alternative. Therefore, truck and equipment operation under alternative B-1 would have a negligible to minor, short-term, adverse impact on the soundscape.

There would be fewer park visitors impacted, although terrestrial fauna would be affected by impacts on the soundscape, because activities under alternative B-1 would take place during the off-season as much as possible. If beach nourishment under alternative B-1 occurred in the fall months, the food gathering and other winter preparation activities of small mammals would be impacted by the sounds and vibrations from the trucks and construction equipment. Additionally, fall migratory birds that find rest, refuge, and forage in the park after their Lake Michigan overflight, would be disturbed and stressed by these activities. Impacts under alternative B-1 would be negligible to minor, short-term and adverse because of these effects on terrestrial fauna.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative B-1. If those impacts were added to the impacts under alternative B-1, there would be negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape from the addition of sound in the park to execute the actions associated with this alternative. Impacts under alternative B-1 would occur on week days during the off-peak months; therefore, actions associated with alternative B-1 would add a very small increment to the overall cumulative impact.

Conclusion. Under alternative B-1 there would be negligible to minor, short-term, adverse impacts on the soundscape from beach nourishment activities. These impacts would be primarily due to sound generated from the trucks hauling the sediment and construction equipment grading the nourishment material along the beach. There would be negligible to minor, short- and long-term, adverse cumulative impacts on the natural soundscape if sounds from the actions

associated with alternative B-1 were added to the existing soundscape environment; however, the actions from this alternative would result in a very small increment being added to the overall cumulative impact since work would be performed during off-peak months and during the week.

Alternative B-5 (Beach Nourishment via Upland Sources, Five-Year Frequency)

Under alternative B-5, beach nourishment would take place similar as described above under alternative B-1, with a few differences. Under alternative B-5, beach nourishment would take place on a five-year frequency instead of an annual frequency. In addition, the implementation of this alternative would effectively close the reach 1 beach for approximately 18 months every five years. Under alternative B-5, there would be minor to moderate, long-term, adverse effects on the soundscape from these beach nourishment activities and the associated sound generated from hauling and grading activities.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative B-5. If those impacts were added to the impacts under alternative B-5, there would be negligible to moderate, short- and long-term, adverse cumulative impacts on the soundscape from the addition of sound in the park to execute the actions associated with this alternative. These cumulative impacts would occur during high-use times (e.g., summer), and on weekdays over the course of approximately 18 months every five years. The actions associated with alternative B-5 would therefore add a large effect to the overall cumulative impact.

Conclusion. Under alternative B-5 there would be minor to moderate, long-term, adverse impacts on the soundscape. These impacts would be primarily due to sound generated from trucks hauling sediment and construction equipment grading the nourishment material along the beach. There would be negligible to moderate, short- and long-term, adverse cumulative impacts on the soundscape. The actions associated with alternative B-5 would therefore add a large effect to the overall cumulative impact since work would be performed during the peak and off-peak seasons.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency)

Under alternative C-1, beach nourishment material would be dredged from an updrift location and placed annually on the beach in reach 1. As many as five bulldozers would be employed to distribute the sediment along the beach. The beach nourishment activities would occur over approximately two months every year during the off-peak season. The beach construction area would be closed to visitors during this time. These actions associated with alternative C-1 would result in negligible to minor, short-term, adverse impacts on the soundscape in the park from the sound they would generate.

Under alternative C-1, dredging equipment would operate 8 to 10 hours per day at a location offshore. Standing at the water's edge, a receptor (i.e., person or animal) would hear the sound of a small- to moderate-sized dredge at a level of approximately 60 dBA on a calm day (Borough of Poole Commissioners 2004). The bulldozers needed to move sediment along the beach would each generate noise levels as high as 95 dBA. Sound intensity attenuates with distance as it propagates over a larger area, generally in a spherical spreading pattern, away from a point source where the sound waves were generated. Generally speaking, noise generated by a point source decreases by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water), and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees)

for each doubling of distance. Visitors would experience near ambient daytime noise levels within the nearby open beach areas because visitors would be excluded from the beach areas where nourishment activities would take place. Visitors would continue to experience the natural sound environment in the park that exists under the no-action alternative. Therefore, truck and equipment operation under alternative C -1 would have a negligible to minor, short-term, adverse impact on the soundscape.

Under alternative C-1, work would be performed during the park's off-season so there would be fewer park visitors impacted by these activities, although the work would impact terrestrial fauna. If beach nourishment occurred in October and November, the food gathering and other winter preparation activities of small mammals would be impacted by the sound and vibrations from the equipment. Further, fall migratory birds that find rest, refuge, and forage in the park after their Lake Michigan overflight, would be disturbed and stressed by these activities. Under alternative C-1, there would be negligible to minor, short-term, adverse impacts on the natural soundscape of Indiana Dunes National Lakeshore during fall performance of the activities associated with this alternative.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-1. If those impacts were added to the impacts under alternative C-1, there would be negligible to minor, short- and long-term, adverse cumulative impacts to the soundscape from the addition of sounds in the park to execute the actions associated with this alternative. These cumulative impacts would occur on weekdays under alternative C-1. Therefore, the actions associated with alternative C-1 would add a very small increment to the overall cumulative impact due to the timing of the actions.

Conclusion. The actions associated with alternative C-1 would result in negligible to minor, short-term, adverse impacts. These impacts would be primarily due to sound generated from barges and construction equipment grading the nourishment material along the beach. There would be negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape if noise impacts under alternative C-1 were added to the existing soundscape; however, the actions from this alternative would result in a very small increment being added to the cumulative impact due to the time of the actions.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency)

Under alternative C-5, beach nourishment material would be placed on the beach as described above for alternative C-1, with a few differences. Beach nourishment activities under alternative C-5 would take place every five years rather than annually. In addition, the nourishment material would be placed on the beach on weekdays over approximately 10 months every five years. The actions associated with alternative C-5 would result in minor to moderate, short-term, adverse impacts on the soundscape in the park due to the dredging and spreading of sediment along the shoreline over an approximate 10-month period every five years.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-5. If those impacts were added to the impacts under alternative C-5, there would be negligible to moderate, short- and long-term, adverse cumulative impacts on the soundscape from the addition of sound in the park to execute the actions associated with this alternative. These cumulative impacts would occur on weekdays over approximately 10 months every five years. The actions associated with alternative C-5 would

therefore add a large increment to the overall cumulative impact.

Conclusion. Under alternative C-5 there would be minor to moderate, short-term, adverse impacts on the soundscape. These impacts would be primarily due to sound generated from construction equipment grading the nourishment material along the beach and from dredging operations. Cumulative impacts would be negligible to moderate, short- and long-term and adverse as sound would occur during peak and off-peak times over approximately 10 months every five years. The actions associated with alternative C-5 would therefore add a large effect to the overall cumulative impact.

Alternative D (Beach Nourishment via Permanent Bypass System)

Under alternative D, a permanent bypass system would be constructed. Construction activities would have a negligible, short-term, adverse impact on the soundscape, lasting only as long as construction. Under this alternative, a permanent bypass system would transport sediment from updrift of the Michigan City Harbor to reach 1. As many as five bulldozers would be employed to distribute the sediment along the beach. The beach construction area would be closed to visitors during this time. These actions associated with alternative D would have negligible, short-term, adverse impacts on the park soundscape.

Under alternative D, the permanent bypass system would operate 8 to 10 hours a day. The exact location of the dredging barges, lift station, and pumps would be determined at a later stage, under a planning effort focused on implementation; however, when standing approximately 300 feet from the equipment, a receptor would be able to hear the sound of a small- to moderate-sized dredge at a level of approximately 60 dBA on a calm day. Bulldozers needed to move sediment along the beach would each generate noise levels at high as 95 dBA. Sound intensity attenuates with distance as it propagates over a larger area, generally in a spherical spreading pattern, away from a point source where the sound waves were generated. Generally speaking, noise generated by a point source decreases by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water), and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of distance. Visitors would experience near ambient daytime noise levels within the nearby open beach areas because visitors would be excluded from the beach areas where nourishment activities would take place. Visitors would continue to experience the natural sound environment in the park that exists under the no-action alternative. Therefore, truck and equipment operation under alternative D would have a negligible to minor, short-term, adverse impact on the soundscape during dredging and spreading operations.

Due to the work being performed under alternative D during the park's off-season, there would be fewer park visitors impacted by these activities, although the work would impact terrestrial fauna, as described under alternative C-1 above, impact food gathering and other winter preparation activities. These actions associated with alternative D would result in negligible to minor, short-term, adverse impacts.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative D. If the impacts under alternative D were added to the existing soundscape, there would be negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape from the addition of sound in the park to execute the actions associated with this alternative. Impacts under alternative D would occur on weekdays during the off-peak months; therefore, the actions associated with alternative D would add a very small increment to the overall cumulative impact.

Conclusion. Under alternative D, there would be negligible to minor, short-term, adverse impacts from the sound that would be generated from construction and associated operations of the permanent bypass system. There would be negligible to minor, short- and long-term, adverse cumulative impacts on the natural soundscape if sound generated from the actions associated with alternative D were added to the existing soundscape; however, the actions from this alternative would result in a very small increment being added to the cumulative impact due to the timing of the work.

Alternative E (Submerged Cobble Berm and Beach Nourishment, Annual Frequency)

Under alternative E, the placement of a submerged cobble berm would be accomplished by employing a barge and crane. The crane would place the submerged cobble berm offshore approximately 10 feet below the water surface and parallel to the shoreline. The total length and design of the submerged cobble berm would be determined at a later stage, under a planning effort focused on implementation. In conjunction with the submerged cobble berm, a beach nourishment program would be used to restore reach 1 of Indiana Dunes National Lakeshore, although a reduced quantity would be needed as the submerged cobble berm would lessen beach erosion. Sediment placed on the beach would be distributed with as many as five bulldozers. The beach nourishment activities would occur during the off-peak season. The beach construction area would be closed to visitors during this time. These actions associated with alternative E would have negligible, short-term, adverse impacts on the park soundscape.

Under alternative E, the dredge equipment would operate 8 to 10 hours per day at a location offshore. Standing at the water's edge, a receptor would hear the sound of a small- to moderate-sized dredge at a level of approximately 60 dBA on a calm day (Borough of Poole Commissioners 2004). Bulldozers needed to move sediment along the beach would each generate noise levels as high as 95 dBA. Sound intensity attenuates with distance as it propagates over a larger area, generally in a spherical spreading pattern, away from a point source where the sound waves were generated. Generally speaking, noise generated by a point source decreases by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water), and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of the distance. Visitors would experience near ambient daytime noise levels within the nearby open beach areas because visitors would be excluded from the beach areas where nourishment activities would take place. They would continue to experience the natural sound environment in the park that exists under the no-action alternative. Therefore, truck and equipment operation under alternative E would have a negligible to minor, short-term, adverse impact on the soundscape during dredging and spreading operations.

There would be fewer park visitors impacted by the actions associated with alternative E since activities would take place during the off-season; therefore, there would be negligible, short-term, adverse impacts to the soundscape from these actions.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative E. If the impacts under alternative E were added to the existing soundscape, negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape would result from the addition of sound in the park to execute the actions associated with this alternative. Under alternative E, impacts would occur on weekdays during the off-peak months; therefore, the actions associated with alternative E would add a very small increment to the overall cumulative impact.

Conclusion. Under alternative E, there would be negligible, short-term, adverse impacts on the soundscape from the beach nourishment activities. These impacts would be primarily due to sound generated from construction activities as well as barges and construction equipment grading the nourishment material along the beach. There would be negligible to minor, short- and long-term, adverse cumulative impacts on the natural soundscape if sound generated from the actions associated with alternative E were added to the existing soundscape; however, the actions associated with this alternative would result in a very small increment being added to the overall cumulative impact.

Alternative F (Beach Nourishment, Annual Frequency with a Mix of Small Natural Stones at the Shoreline) – Preferred Alternative

Under alternative F, the preferred alternative, a beach nourishment program with a mix of small natural stone, dredged sediment, and coarse upland material at the shoreline would be used to restore reach 1 of Indiana Dunes National Lakeshore. Sediment placed on the beach would be distributed with as many as five bulldozers. The beach nourishment activities would occur during the off-peak season. The beach construction area would be closed to visitors during this time. These actions associated with alternative F would have negligible, short-term, adverse impacts on the park soundscape.

Under alternative F, the dredge equipment would operate 8 to 10 hours per day at a location offshore. Standing at the water's edge, a receptor would hear the sound of a small- to moderate-sized dredge at a level of approximately 60 dBA on a calm day (Borough of Poole Commissioners 2004). Bulldozers needed to move sediment along the beach would each generate noise levels as high as 95 dBA. Trucks would deliver coarse material and small native stones to reach 1, and bulldozers would be actively mixing the sediment and rocks. Depending on the age and condition of the construction equipment, noise levels from a large diesel truck would range up to near 90 dBA at a distance of 50 feet, while the bulldozer sound level would range up to 95 dBA at a distance of 50 feet (EPA 1971). Sound intensity attenuates with distance as it propagates over a larger area, generally in a spherical spreading pattern, away from a point source where the sound waves were generated. Generally speaking, noise generated by a point source decreases by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water), and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of the distance. Visitors would experience near ambient daytime noise levels within the nearby open beach areas because visitors would be excluded from the beach areas where nourishment activities would take place. They would continue to experience the natural sound environment in the park that exists under the no-action alternative. Therefore, truck and equipment operation under alternative F would have a negligible to minor, short-term, adverse impact on the soundscape during dredging and spreading operations.

There would be fewer park visitors impacted by the actions associated with alternative F since visitors would be excluded from areas while beach nourishment activities are taking place; therefore, there would be negligible, short-term, adverse impacts to the soundscape from these actions.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under the preferred alternative. If the impacts under alternative F were added to the existing soundscape, negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape would result from the addition of sound in the park to execute the actions associated with this alternative. Under the preferred alternative, impacts would occur on

weekdays during the off-peak months; therefore, the actions associated with alternative F would add a very small increment to the overall cumulative impact.

Conclusion. Under alternative F, there would be negligible, short-term, adverse impacts on the soundscape from the beach nourishment activities. These impacts would be primarily due to sound generated from barges, and from trucks and bulldozers mixing and grading the nourishment material along the beach. There would be negligible to minor, short- and long-term, adverse cumulative impacts on the natural soundscape if sound generated from the actions associated with alternative F were added to the existing soundscape; however, the actions associated with this alternative would result in a very small increment being added to the overall cumulative impact.

SHORELINE AND BEACH COMPLEX, REACHES 3 AND 4

Alternative A (No-action Alternative)

Under the no-action alternative in reaches 3 and 4, there would be no changes to the park's soundscape. The current beach nourishment program includes the dredging of sediment annually around the NIPSCO/Bailly intake and placing it in the nearshore at Portage Lakefront and Riverwalk. The sediment is then graded along the beach with minimal equipment, having minor, short-term, adverse impacts from the sound that is generated during placement and grading activities. As described in the "Affected Environment" chapter, there are numerous human and natural components of sound in and around the park. Under the no-action alternative, there would be no new impacts on the soundscape from these existing actions.

Cumulative Impacts. The cumulative impacts under alternative A for reaches 3 and 4 would be similar to those described above for the no-action alternative for reaches 1 and 2. Overall, there would be negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape if the impacts under the no-action alternative were added to the existing soundscape. The actions under alternative A would add a small increment to the overall cumulative impact.

Conclusion. Under alternative A, there would be minor, short-term, adverse impacts from beach nourishment activities related to sound generated from the sediment being graded along the shoreline. There would be no new impacts on the existing soundscape in reaches 3 and 4 since no new actions would be taken under alternative A. Cumulatively, there would be negligible to minor, short- and long-term, adverse impacts on the natural soundscape. The actions under alternative A would result in a very small increment being added to the overall cumulative impact.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency) – Preferred Alternative

Under alternative C-1, sediment would be dredged from an updrift location in Lake Michigan and placed annually on the beach at Portage Lakefront and Riverwalk. As many as five bulldozers would be employed to distribute the sediment along the beach. The beach nourishment activities would occur over an approximate two-month period every year during the off-peak season. The beach construction area would be closed to visitors during this time. These actions would result in negligible, short-term, adverse impacts on the soundscape in the park from the associated sound generation.

Ambient daytime noise levels within reach 3 may range from 30 dBA in areas away from human activities to higher than 60 dBA near areas of greater human activity such as Burns International Harbor to the east and the residential community of Ogden Dunes to the west. Under alternative C-1 in reaches 3 and 4, dredging equipment would operate 8 to 10 hours per day offshore. Standing at the water's edge, a receptor would hear the sound of small- to moderate-sized dredging

equipment at a level of approximately 60 dBA on a calm day. Bulldozers needed to move sediment along the beach would each generate noise levels as high as 95 dBA. Sound intensity attenuates with distance as it propagates over a larger area, generally in a spherical spreading pattern, away from a point source where the sound waves were generated. Generally speaking, noise generated by a point source decreases by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water), and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of distance. Visitors would experience near ambient daytime noise levels within the nearby open beach areas because visitors would be excluded from the beach areas where nourishment activities would take place. Visitors would continue to experience the natural sound environment in the park that exists under the no-action alternative. Therefore, construction equipment operation under alternative C-1 would have a negligible to minor, short-term, adverse impact on the soundscape during dredging and spreading operations.

Due to the work being performed under alternative C-1 during the park's off-season, there would be fewer park visitors impacted by these activities, although the work would impact terrestrial fauna, as described under alternative C-1 for reaches 1 and 2. Under alternative C-1, there would be negligible to minor, short-term, adverse impacts on the natural soundscape of Indiana Dunes National Lakeshore.

Additionally, due to the location of reaches 3 and 4 in the park, construction-related traffic would have to commute through surrounding neighborhoods to access this area, increasing the daily traffic and related traffic sounds generated for residents and park visitors. Such increases in traffic (and thus, traffic-related sounds) would have a negligible to minor, short-term, adverse impact on the soundscape.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under the preferred alternative. If the impacts under alternative C-1 were added to the existing soundscape, there would be negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape from the addition of sound in the park to execute the actions associated with this alternative. Under alternative C-1, impacts would occur on weekdays during the off-peak months; therefore, the actions associated with alternative C-1 would add a very small increment to the overall cumulative impact.

Conclusion. Under alternative C-1, there would be negligible to minor, short-term, adverse impacts. These impacts would be primarily due to sound generated from barges and construction equipment grading the nourishment material along the beach. There would be negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape if sound generated from the activities associated with alternative C-1 were added to the existing soundscape; however, these actions would result in a very small increment being added to the overall cumulative impact due to the timing of the actions.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency)

The beach nourishment activities that would take place under alternative C-5 would be similar to those described above for alternative C-1, with a few differences. Under alternative C-5, beach nourishment activities would take place every five years rather than annually, and these activities would occur over approximately six months every five years. Such actions would have minor to moderate, short-term. adverse impacts on the soundscape from the sounds that would be generated.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-5. If the impacts under alternative C-5 were added to the existing soundscape, there would be negligible to moderate, short- and long-term, adverse cumulative impacts on the natural soundscape from the addition of sound in the park to execute the actions associated with this alternative. Impacts under alternative C-5 would occur on weekdays for approximately six months every five years. The actions associated with alternative C-5 would therefore add a large effect to the overall cumulative impact.

Conclusion. Under alternative C-5, there would be minor to moderate, short-term, adverse impacts primarily due to sound generated from construction equipment grading the nourishment material along the beach. There would be negligible to moderate, short- and long-term, adverse cumulative impacts on the soundscape as sounds would be generated and occur during high-use times and on weekdays over approximately six months every five years. The actions associated with alternative C-5 would therefore add a large effect to the overall cumulative impact from the sound that would be generated.

Alternative D (Beach Nourishment via Permanent Bypass System)

Impacts under alternative D in reaches 3 and 4 would be similar to those described above for alternative D in reaches 1 and 2. That is, negligible to minor, short-term, adverse impacts from the sound that would be generated from construction of the permanent bypass system.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative D. If the impacts under alternative D were added to the existing soundscape, there would be negligible to minor, short- and long-term, adverse cumulative impacts on the soundscape from the addition of sound in the park to execute the actions associated with this alternative. Impacts under alternative D would occur on weekdays during the off-peak months; therefore, the actions associated with alternative D would add a very small increment to the overall cumulative impact.

Conclusion. Under alternative D, there would be negligible to minor, short-term, adverse impacts from the sound that would be generated from construction and associated operations of the permanent bypass system. There would be negligible to minor, short- and long-term, adverse cumulative impacts on the natural soundscape if sound generated from the actions associated with alternative D were added to the existing soundscape; however, the actions from this alternative would result in a very small increment being added to the cumulative impact due to the timing of the work.

FOREDUNE AND DUNE COMPLEX, REACHES 1 THROUGH 4

Current Management Actions

The continuation of current management actions described in "The Alternatives" chapter for the foredune and dune complex in reaches 1 through 4 would have no new effect on the *existing* soundscape since no new actions would be introduced into any of the reaches.

Proposed Management Actions

The proposed management actions described in "The Alternatives" chapter for the foredune and dune complex for reaches 1 through 4 would add negligible, short-term, adverse impacts on the natural soundscape in the park related to the sound generated from the proposed realignment of trails, and development of picnic areas, parking lots, access points, etc. These impacts would be

temporary, lasting only as long as construction.

Cumulative Impacts. Sound from development that results from Phase II of the Marquette Plan (IDNR *et al.* 2005) would add negligible, short-term, adverse impacts on the natural soundscape. The Northern Indiana Commuter Transportation District (the South Shore Railroad), which currently traverses the park, incrementally adds minor, long-term, adverse effects to the natural soundscape in the park from the sounds generated during daily operation of the train. Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under soundscape as a result of proposed management actions would be negligible to minor, short- and long-term, and adverse from the incremental addition of sounds in the park during construction (short-term) and operation (long-term) of proposed upgrades and developments.

Conclusion. Impacts on the foredune and dune complex in reaches 1 through 4 under the soundscape as a result of proposed management actions would be negligible, short-term, and adverse from the sound that would be generated during the proposed realignment of trails, and development of picnic areas, parking lots, access points, etc. These impacts would be temporary, lasting only as long as construction. Likewise, sound from development that results from Phase II of the Marquette Plan (IDNR *et al.* 2005) would add negligible, short-term, adverse impacts on the natural soundscape. The Northern Indiana Commuter Transportation District (the South Shore Railroad), which currently traverses the park, adds minor, long-term, adverse effects to the natural soundscape in the park from the sounds generated during daily operation of the train. Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under terrestrial habitat as a result of proposed management actions would be negligible to minor, short- and long-term, and adverse.

VISITOR EXPERIENCE

METHODOLOGY

Information about visitor use and experience at Indiana Dunes National Lakeshore was compiled from data from park records and studies of similar actions and effects. Impacts were assessed qualitatively for this resource, based on the project team's knowledge and best professional judgment regarding how the proposed actions for each alternative would impact visitor use and experience in the park.

Intensity Level Definitions

Intensity thresholds for visitor experience are defined as follows:

Negligible: The impact is barely detectable and/or would result in no noticeable or perceptible changes in visitors' experience at the park.

Minor: The impact is slight but detectable and/or would result in small but noticeable changes in visitors' experience at the park.

Moderate: The impact is readily apparent and would result in easily detectable changes in visitors' experience at the park.

Major: The impact is severely adverse or exceptionally beneficial, and/or would result in appreciable changes in visitors' experience at the park.

SHORELINE AND BEACH COMPLEX, REACHES 1 AND 2

Alternative A (No-action Alternative)

Under the no-action alternative, visitor opportunities would remain essentially unchanged as the existing management protocol for the shoreline would be continued. Impacts on visitor experience under the no-action alternative would be minor, short-term, and adverse from temporary beach closings during intermittent beach nourishment and grading activities in reach 1. Under the no-action alternative, moderate, long-term, adverse impacts would result from degradation of popular visitor amenities within reaches 1 and 2, as a result of continued shoreline erosion and no new actions being taken.

Cumulative Impacts. Under the no-action alternative, restoration and preventative work in the park would incrementally add minor, short-term, adverse impacts on visitor experience from the resulting trail and beach closings. This work would also have a minor, long-term, beneficial impact on visitor experience from decreased future trail and beach closings and improved scenic views (from restoring natural views), ultimately improving the overall visitor experience at the park. Any action in the park resulting in trail closings and/or pedestrian detours would be readily apparent to visitors, who could express an opinion about them.

Ongoing and planned facility upgrades would incrementally add a negligible to minor, short-term, adverse impact on visitor experience during construction and renovation activities; however, following construction, there would be minor, long-term, beneficial impacts on visitor experience from the availability of improved facilities in the park and from a reduction in future closings of facilities for maintenance and upkeep.

Overall, there would be negligible to minor, short- and long-term, adverse and beneficial, cumulative impacts on visitor experience if the impacts under the no-action alternative were added to the existing visitor environment. Adverse impacts would result from the temporary beach, trail, and facility closings for maintenance work and upgrades, and beneficial impacts would result from the

reduction in future closings, improved access to better facilities, and restoration of scenic views to more natural views. The actions under alternative A would add a small increment to the overall cumulative impact.

Conclusion. Under alternative A, the impact of taking no new actions in the park would be a minor to moderate, short- and long-term, adverse impact on visitor experience from temporary beach closings and ongoing degradation of popular visitor amenities from continued shoreline erosion. Impacts would continue under alternative A, even though the no-action alternative would have no new impacts on visitor experience. Cumulatively, there would be negligible to minor, short- and long-term, adverse and beneficial impacts on visitor experience. The actions associated with alternative A would result in a small increment being added to the overall cumulative impact.

Alternative B-1 (Beach Nourishment via Upland Sources, Annual Frequency)

Under alternative B-1, the quantity of beach nourishment material that would be mined and delivered to the lakeshore would be increased compared to alternative A. The sediment would be placed at Crescent Dune on an annual basis over an approximate four-month period each year. To the extent possible, efforts would be made to minimize impacts on visitor experience by conducting beach nourishment activities during off-peak months (i.e., fall and winter months). The actions associated with alternative B-1 would have minor, short-term, adverse impacts on visitor experience from the additional trucks and grading equipment that would appear along the shoreline on an annual basis, disrupting the natural viewsheds of the park for visitors.

Under alternative B-1, the placement area would be temporarily closed to visitors during placement activities for safety purposes, resulting in minor, short-term, adverse impacts on visitor experience from access removal. The actions associated with alternative B-1 would also result in minor, short-term, beneficial impacts on visitor experience as there would be a temporary increase in beach size in the placement area near Mount Baldy, expanding the area available for visitor use and enjoyment.

The actions associated with alternative B-1 would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, resulting in minor, short-term, beneficial impacts on visitor experience from decreased trail and beach closings and pedestrian detours for maintenance and restoration efforts. The shorelines downdrift of Mount Baldy would receive an infusion of sediment from the beach nourishment activities under alternative B-1, impacting not only reach 1, but reach 2 and a portion of reach 3, as well, similarly reducing cyclic maintenance and restoration demands in those areas, having a minor, short-term, beneficial impact on visitor experience.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative B-1. If the impacts under alternative B-1 were added to the existing environment for visitor experience, there would be minor, short-term, adverse impacts from beach and trail closings for beach nourishment activities, as well as minor, short-term, beneficial, cumulative impacts from decreased future closings and expanded area available for visitor use during the temporary increase in beach size near Mount Baldy. The actions associated with alternative B-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative B-1, there would be minor, short-term and adverse impacts during temporary beach and trail closings for nourishment activities in reach 1. There would also be minor, short-term, beneficial impacts on visitor experience due to the temporary increase in beach size and reduction in future trail closings. The actions

associated with this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short-term, adverse and beneficial, cumulative effects.

Alternative B-5 (Beach Nourishment via Upland Sources, Five-Year Frequency)

Under alternative B-5, the beach nourishment activities described above for alternative B-1 would be similar, with a few differences. The amount of beach nourishment material mined and delivered to the lakeshore from a permitted upland source via trucks would be increased relative to the no-action alternative, and would be placed along the lakeshore for approximately 18 months every five years. Such actions would result in moderate, long-term, adverse impacts on visitor experience from the beach and trail closings for safety reasons. Additionally, under alternative B-5, beach nourishment activities would require additional trucks and grading equipment along the shoreline for approximately 18 months every five years, resulting in additional visual intrusions to the viewshed for visitors, resulting in minor, long-term, adverse impacts.

The actions associated with alternative B-5 would cause a temporary increase in beach size in reach 1, having a minor, short-term, beneficial impact on visitor experience from the expanded area available for visitor use and enjoyment. The actions associated with alternative B-5 would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, and would result in minor, long-term, beneficial impacts on visitor experience from fewer future beach closings for cyclic maintenance and restoration work.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative B-5. Compared to the cumulative impacts expected under the no-action alternative, under alternative B-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term and adverse and beneficial from the beach and trail closings during placement activities (adverse) and from fewer future closings for cyclic maintenance and restoration work (beneficial). The actions associated with alternative B-5 would provide a substantial incremental contribution to overall cumulative impacts.

Conclusion. Under alternative B-5, there would be minor to moderate, long-term, adverse impacts on visitor experience from the visual intrusions being introduced into the park during beach nourishment activities and the beach and trail closings during placement work. In addition, under this alternative there would be minor, short- and long-term, beneficial impacts from the temporary increase in beach size and future reduction in beach closings for nourishment activities due to the decrease in erosion. The actions associated with this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, adverse and beneficial impacts.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency)

Under alternative C-1, beach nourishment material would be dredged from an updrift location and placed on the beach in reach 1 on an annual basis. The amount of sediment would fulfill the calculated sediment budget deficit for reach 1, and this placement would occur during an approximate two-month period each year when impacts on visitor use would be minimized to the extent possible (i.e., during fall or winter months). Overall, minor, short-term, adverse impacts on visitor experience would result under alternative C-1 as nourishment would require barges and

additional grading equipment along the shoreline on an annual basis, impacting the natural viewshed of visitors in the park. Placement activities associated with alternative C-1 would have minor, short-term, adverse impacts on visitor experience from the associated beach and trail closings. A minor, short-term, beneficial impact would also result as there would be a temporary increase in beach size in the beach area near Crescent Dune and Mount Baldy, expanding the area of beach available for visitor use and enjoyment.

The actions associated with alternative C-1 would fulfill the sediment budget deficit calculated for reach 1 and prevent additional erosion. This would result in minor, short-term, beneficial impacts on visitor experience from decreased beach and trail closings that result from cyclic maintenance and restoration work (which would be reduced). The shorelines downdrift of Mount Baldy would receive an infusion of sediment from the beach nourishment activities under alternative C-1, impacting not only reach 1, but reach 2 and a portion of reach 3, as well, similarly reducing cyclic maintenance demands in those areas. This would result in fewer beach closings for work in those areas, again having a minor, short-term, beneficial impact on visitor experience.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-1. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-1, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor, short- and long-term and adverse and beneficial from the temporary beach and trail closings required during placement activities, the additional visual intrusions that would be introduced into the park, and the decrease in beach and trail closings for annual maintenance and restoration work. The actions associated with alternative C-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-1, there would be minor, short-term, adverse impacts that would result from the temporary beach closings and visual intrusions being introduced into the park during placement activities. There would also be minor, short-term, beneficial impacts on visitor experience from the temporary increase in beach size and the decrease in future beach closings that would result from less restoration work having to be performed (from reduced erosion). The actions associated with this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term, adverse and beneficial, cumulative impacts.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency)

Under alternative C-5, the beach nourishment activities and impacts described above for alternative C-1 would be similar with a few differences. Under alternative C-5, the beach nourishment material would be dredged every five years rather than annually and dredging activities would take approximately 10 months to complete every five years (longer than the approximate two-month period under alternative C-1 due to the greater volume of sediment being placed and distributed). Under alternative C-5, there would be moderate, short-term, adverse impacts on visitor experience from implementation of this alternative, as beach nourishment would require additional grading equipment along the shoreline for approximately 10 months on a five-year frequency, interrupting the natural viewshed experienced by visitors. Dredging and placement operations would have moderate, short-term, adverse impacts on visitor experience from the associated beach and trail closings that would take place for safety reasons.

The actions associated with alternative C-5 would have a minor, short-term, beneficial impact on visitor experience as the beach would experience a temporary increase in size near Crescent Dune and Mount Baldy, resulting in a greater area of beach being available for visitor use and enjoyment. The actions associated with alternative C-5 would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, resulting in minor, long-term, beneficial impacts on visitor experience from fewer future beach and trail closings that would take place for cyclic maintenance and restoration work (which would be reduced).

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-5. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term and adverse and beneficial from the temporary beach and trail closings during dredging and placement activities and the visual intrusions that would be added, and from the resultant decrease in future work related to maintenance and restoration of the shoreline (as erosion would decrease). The actions associated with alternative C-5 would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-5, there would be moderate, short-term, adverse impacts during dredging and placement activities from temporary beach and trail closings and the visual intrusions such activities and construction equipment would introduce into the visitor's viewshed. There would also be minor, short- and long-term, beneficial impacts on visitor experience from the temporary increase in beach size and the decrease in future beach closings that would result from reduced erosion (and thus reduced maintenance and restoration activities that require beach closings). The actions associated with this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term and adverse and beneficial, cumulative effects.

Alternative D (Beach Nourishment via Permanent Bypass System)

Under alternative D, a permanent bypass system would transport sediment to reach 1. The actions associated with alternative D would not result in major changes to visitor experience; however, there would be minor, short-term, adverse impacts from distributing the sediment placed, due to the visual intrusion additional construction equipment would introduce into the park to construct the permanent bypass system, and from the temporary beach and trail closings that would result for safety reasons. Under alternative D, the beach size would temporarily increase and result in minor, short-term, beneficial impacts on visitor experience from the expanded area that would be available for visitor use and enjoyment.

Under alternative D, the permanent small lift stations that would be constructed would be visible near the shoreline, introducing a visual intrusion in the park and interrupting the natural viewshed experienced by visitors. Such actions would have a minor, long-term, adverse impact on visitor experience. The visible lift stations proposed under alternative D would pose a safety hazard to nonconfident swimmers in the park, having a negligible to minor, long-term, adverse effect on visitor experience.

The actions associated with alternative D would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, and would result in minor, short-term, beneficial impacts on visitor experience from reduced beach and trail closings that result from cyclic maintenance and restoration work (which would be reduced). The shorelines downdrift of Mount Baldy

would receive an infusion of sediment from these beach nourishment activities, impacting not only reach 1, but reach 2 and a portion of reach 3, as well, similarly reducing cyclic maintenance and restoration work in those areas, resulting in minor, short-term, beneficial impacts on visitor experience from fewer beach and trail closings.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative D. Compared to the cumulative impacts expected under the no-action alternative, under alternative D, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor, short- and long-term and adverse and beneficial. The actions associated with alternative D would provide a small incremental contribution to overall cumulative impacts in those areas.

Conclusion. Under alternative D, there would be minor, short- and long-term, adverse impacts on visitor experience from temporary beach closings, the visual intrusions construction of the permanent bypass system would introduce in to the park during construction (i.e., construction equipment), and hazards posed to nonconfident swimmers by the lift and pump stations. There would also be minor, short-term, beneficial impacts from the reduction in future beach closings that would result from less cyclic maintenance and restoration work needing to be performed from reduced erosion, as well as the temporary increase in beach size. Implementation of alternative D would also result in minor, long-term, adverse impacts to visitor experience from the visual intrusion the small lift stations would introduce to the park. The actions associated with this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term, adverse and beneficial, cumulative effects.

Alternative E (Submerged Cobble Berm and Beach Nourishment, Annual Frequency)

Under alternative E, a submerged cobble berm would be used in conjunction with a beach nourishment program to restore reach 1 of Indiana Dunes National Lakeshore. This alternative would stabilize the shoreline through the area, reduce the amount of sediment required to continually replenish the supply of beach sediment, and lessen the interruptions in visitor use of the beach from trucks, grading equipment, and nourishment-related activities. Such actions would have moderate, long-term, beneficial impacts on visitor experience from reduced beach closings for nourishment activities and a reduction in the presence of construction and grading equipment on the beach (improving the visitor's viewshed).

During construction of the submerged cobble berm and beach nourishment activities, there would be minor, short-term, adverse impacts on visitor experience from temporary beach closings and installation activities. Such closings would last only as long as construction and placement of the submerged cobble berm. As described in "The Alternatives" chapter, the submerged cobble berm would be placed in approximately 10 feet of water (at low water datum), with a top elevation of approximately 4 feet below low water datum. The presence of the submerged cobble berm would result in negligible to minor, short-term, adverse impacts as it would pose a safety concern to boaters, particularly deep draft vehicles, before it would disperse across the lakebed. As the submerged cobble berm dissipates, the individual cobble material would be carried towards the beach via wave action to approximately 5 to 6.5 feet below water. The area between this water depth and the shoreline would remain largely free of cobbles. Additionally, after the berm has been re-shaped, nourishment material placed in subsequent years would cover the berm material, leaving a largely sandy substrate. The submerged cobble berm would have negligible

to minor, short-term, adverse impacts on visitor experience, as swimmers would come into contact (though minimal) with the cobbles until they were covered with the additional nourishment material. Mitigation measures would be considered to offset the safety concerns posed to visitors under this alternative.

The actions associated with alternative E would temporarily increase the beach size in reach 1, resulting in minor, short-term, beneficial impacts on visitor experience from the expanded area available for visitor use and enjoyment.

Under alternative E, the submerged cobble berm that would be constructed would result in minor, long-term, adverse impacts on visitor experience from the visual intrusion it would create. The submerged cobble berm would potentially be seen from elevated heights in the park before dispersing along the lake bottom. Minor, short-term, adverse impacts would also result, as the barges used in the dredging operations and the grading equipment for current nourishment activities would interrupt the aesthetics of the shoreline during nourishment on an annual basis. The actions associated with alternative E would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, and result in minor, long-term, beneficial impacts on visitor experience from fewer beach and trail closings as a result of less cyclic maintenance and restoration work needing to be performed in the park.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative E. Compared to the cumulative impacts expected under the no-action alternative, under alternative E, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term and adverse and beneficial. Adverse impacts would result from the temporary beach and trail closings during construction and installation of the submerged cobble berm, from the visual intrusions that the submerged cobble berm would introduce into the park, and from the safety concerns the submerged cobble berm would pose to boaters until it had dissipated. Beneficial impacts would result from the decreased erosion that would result, reducing the frequency of beach and trail closings for cyclic maintenance and restoration work. The actions associated with alternative E would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under alternative E, there would be would minor, short- and long-term, adverse impacts on visitor experience during construction of the submerged cobble berm due to the temporary beach closings and visual intrusion the submerged cobble berm would introduce into the park and the safety concerns it would pose to boaters before dissipation. The submerged cobble berm, until it had dispersed along the lakebed, would result in negligible to minor, long-term, adverse impacts on visitors from the safety concerns it would pose. The park would consider implementing mitigation measures to offset these concerns. Under alternative E, there would also be minor, short- and long-term, beneficial impacts from the reduced maintenance demands and reduced restoration demands that would result in fewer beach and trail closings. The actions of this alternative, when combined with other past, present, and reasonably foreseeable actions would result in minor to moderate, short- and long-term, adverse and beneficial, cumulative effects.

Alternative F (Beach Nourishment, Annual Frequency with a Mix of Small Natural Stone at the Shoreline) – Preferred Alternative

Under alternative F, beach nourishment material would be dredged from an updrift location and trucked from an upland source and placed on the beach in reach 1 on an

annual basis. The amount of sediment would fulfill the calculated sediment budget deficit for reach 1, and this placement would occur during an approximate two-month period each year when impacts on visitor use would be minimized to the extent possible (i.e., during fall or winter months). Overall, minor, short-term, adverse impacts on visitor experience would result under alternative F as beach nourishment activities would require barges, trucks, and additional mixing and grading equipment along the shoreline on an annual basis, impacting the natural viewshed of visitors in the park. Placement activities associated with alternative F would have minor, short-term, adverse impacts on visitor experience from the associated beach and trail closings. A minor, short-term, beneficial impact would also result as there would be a temporary increase in beach size in the beach area near Crescent Dune and Mount Baldy, expanding the area of beach available for visitor use and enjoyment.

The actions associated with alternative F would fulfill the sediment budget deficit calculated for reach 1 and prevent additional erosion. This would result in minor, short-term, beneficial impacts on visitor experience from decreased beach and trail closings that result from cyclic maintenance and restoration work (which would be reduced). The shorelines downdrift of Mount Baldy would receive an infusion of sediment from the beach nourishment activities under alternative F, impacting not only reach 1, but reach 2 and a portion of reach 3, as well, similarly reducing cyclic maintenance demands in those areas. This would result in fewer beach closings for work in those areas, again having a minor, short-term, beneficial impact on visitor experience.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative F. Compared to the cumulative impacts expected under the no-action alternative, under alternative F, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor, short- and long-term and adverse and beneficial from the temporary beach and trail closings required during placement activities, the additional visual intrusions that would be introduced into the park, and the decrease in beach and trail closings for annual maintenance and restoration work. The actions associated with alternative F would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative F, there would be minor, short-term, adverse impacts that would result from the temporary beach closings and visual intrusions being introduced into the park during placement activities. There would also be minor, short-term, beneficial impacts on visitor experience from the temporary increase in beach size and the decrease in future beach closings that would result from less restoration work having to be performed (from reduced erosion). The actions associated with this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term, adverse and beneficial, cumulative impacts.

SHORELINE AND BEACH COMPLEX, REACHES 3 AND 4

Alternative A (No-action Alternative)

Under the no-action alternative for reaches 3 and 4, visitor opportunities would remain essentially unchanged and the existing management protocol for the shoreline would be continued, including the continuation of the dredging of sediment annually around the NIPSCO/Bailly intake. Impacts on visitor experience under the no-action alternative would be similar to those described above for alternative A under reaches 1 and 2. That is, visitor opportunities would remain essentially unchanged as the existing management protocol for the shoreline would be continued. Impacts on visitor experience

under the no-action alternative would be minor, short-term, and adverse from temporary beach closings during current clean sediment beach nourishment and grading activities in reach 3. Under the no-action alternative, moderate, long-term, adverse impacts would result from degradation of popular visitor amenities within reaches 3 and 4, as a result of continued shoreline erosion and no new actions being taken.

Cumulative Impacts. The cumulative impacts under alternative A in reaches 3 and 4 would be similar to those described above for the no-action alternative under reaches 1 and 2. That is, the proposed plan would incrementally add negligible to minor, short- and long-term, adverse and beneficial effects on visitor experience. Adverse impacts would result from the temporary beach, trail, and facility closings for maintenance work and upgrades, and beneficial impacts would result from the reduction in future closings, improved access to better facilities, and restoration of scenic views to more natural views. The actions under alternative A would add a small increment to the overall cumulative impact.

Conclusion. Under alternative A, the impact of taking no new actions in the park would be a minor to moderate, short- and long-term, adverse impact on visitor experience from temporary beach closings and ongoing degradation of popular visitor amenities from continued shoreline erosion. Impacts would continue under alternative A, even though the no-action alternative would have no new impacts on visitor experience. Cumulatively, there would be negligible to minor, short- and long-term, adverse and beneficial impacts on visitor experience. The actions associated with alternative A would result in a small increment being added to the overall cumulative impact.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency) – Preferred Alternative

The actions and impacts under alternative C-1 in reaches 3 and 4 would be similar to those described earlier for alternative C-1 under reaches 1 and 2. That is, minor, short-term and adverse from the visual intrusions the barges and additional grading equipment along the shoreline would introduce into the park on an annual basis for an approximate two-month period each year; minor, short-term and adverse from beach and trail closings and minor, short-term and beneficial as there would be a temporary increase in beach size in reach 3, expanding the area of beach available for visitor use and enjoyment.

The actions associated with alternative C-1 would fulfill the sediment budget deficit for reach 3, preventing additional erosion, resulting in minor, short-term, beneficial impacts on visitor experience from reduced beach and trail closings that would result from cyclic maintenance and restoration work (which would be reduced). reach 4 would receive an infusion of sediment from the beach nourishment activities under alternative C-1, similarly reducing cyclic maintenance and restoration demands in that area. This would result in fewer beach closings for that work, again having a minor, short-term, beneficial impact on visitor experience.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would apply under alternative C-1. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-1, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor, short- and long-term and adverse and beneficial. The actions associated with alternative C-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-1, there would be minor, short-term, adverse impacts on visitor experience from the visual intrusions introduced into the park and the annual beach and trail closings that would be required during nourishment activities for safety reasons. There would also be minor, short-term, beneficial impacts under this alternative from the temporary increase in beach size in reach 3 (resulting in an expanded area for visitor use and enjoyment), and from reductions in the amount of maintenance and restoration work required from decreased erosion (resulting in fewer beach closings). This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term and adverse and beneficial, cumulative effects. The actions of alternative C-1 would add a small increment to the overall cumulative impacts.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency)

Under alternative C-5 in reaches 3 and 4, the impacts would be similar to those described above for alternative C-5 under reaches 1 and 2. That is, minor to moderate, short-term, adverse impacts would result from implementation of this alternative, as beach nourishment would require additional grading equipment along the shoreline for approximately six months every five years. This would disrupt the viewshed experienced by visitors. Minor to moderate, short-term, adverse impacts would result under alternative C-5 from beach and trail closings during placement activities for safety reasons. Minor, short-term, beneficial impacts would result from the temporary increase in beach size that would make a greater area of beach available for visitor use and enjoyment.

The actions associated with alternative C-5 would fulfill the sediment budget deficit for reach 3 and prevent additional erosion. This would result in minor, long-term, beneficial impacts on visitor experience due to fewer future beach and trail closings that would take place during cyclic maintenance and restoration work (which would be reduced). Reach 4 would receive an infusion of sediment from the beach nourishment activities under alternative C-5. This would reduce cyclic maintenance and restoration demands in that area, and would result in fewer beach closings for that work, again having a minor, long-term, beneficial impact on visitor experience.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would apply under alternative C-5 for reaches 3 and 4. Under alternative C-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term and adverse and beneficial from the temporary beach and trail closings during dredging and placement activities and the visual intrusions that would be added to the park, and from the resultant decrease in future work related to maintenance and restoration of the shoreline (as erosion would decrease. The actions associated with alternative C-5 would provide a substantial incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-5, there would be minor to moderate, short-term, adverse impacts on visitor experience from the six-month period of beach closings that would take place every five years and the visual intrusions that would be introduced into the visitors' viewshed. There would also be minor, short- and long-term, beneficial impacts under this alternative from the temporary increase in beach size, providing visitors with an expanded area to use and enjoy, and from the reduction in future maintenance and restoration work in the park (which would reduce the number of beach and trail closings). The actions of this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short-

and long-term and adverse and beneficial, cumulative effects.

Alternative D (Beach Nourishment via Permanent Bypass System)

The actions and impacts that would result under alternative D in reaches 3 and 4 would be similar to those described earlier for alternative D in reaches 1 and 2. That is, minor, short-term, adverse impacts would result on an annual basis from distributing the sediment placed, due to the visual obtrusion additional construction equipment would introduce into the park, and from the temporary beach and trail closings that would result for safety reasons. Under alternative D, the beach size would temporarily increase and result in minor, short-term, beneficial impacts on visitor experience from the expanded area that would be available for visitor use and enjoyment.

Under alternative D, the small lift stations that would be constructed would be visible near the shoreline, introducing a visual intrusion in the park and interrupting the natural viewshed experienced by visitors. Such actions would have a minor, long-term, adverse impact on visitor experience.

The actions associated with alternative D would fulfill the sediment budget deficit for reach 3, preventing additional erosion, and would result in minor, short-term, beneficial impacts on visitor experience from reduced beach and trail closings that result from cyclic maintenance and restoration work (which would be reduced). The shorelines downdrift of reach 3 would receive an infusion of sediment from these beach nourishment activities, impacting reach 4, similarly reducing cyclic maintenance and restoration work in that area, resulting in minor, short-term, beneficial impacts on visitor experience from fewer beach and trail closings.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative D. Compared to the cumulative impacts expected under the no-action alternative, under alternative D, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor, short- and long-term, and adverse and beneficial. The actions associated with alternative D would provide a small incremental contribution to overall cumulative impacts in those areas.

Conclusion. Under alternative D, there would be minor, short- term, adverse impacts on visitor experience from temporary beach closings and visual intrusions being introduced into the park. There would also be minor, short-term, beneficial impacts from the reduction in future beach closings that would result from less cyclic maintenance and restoration work needing to be performed from reduced erosion, as well as the temporary increase in beach size. Implementation of alternative D would also result in minor, long-term, adverse impacts to visitor experience from the visual intrusion the small lift stations would introduce to the park. The actions associated with this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term, adverse and beneficial, cumulative effects.

FOREDUNE AND DUNE COMPLEX, REACHES 1 THROUGH 4

Current Management Actions

The current management actions described in "The Alternatives" chapter for the foredune and dune complex have multiple impacts on visitor experience. Ongoing facility upgrades in the park have negligible to minor, short-term, adverse impacts on visitor experience from the temporary loss of access to these facilities and the visual intrusions that are introduced into the park during construction/renovation. Such upgrades also

have negligible to minor, long-term, beneficial impacts on visitor experience from access to improved facilities and a reduction in future closings of these facilities for cyclic maintenance.

Current beach nourishment activities in the park have minor, short-term, adverse effects on visitor experience from the resulting beach closings during nourishment activities for safety reasons. Similarly, existing restoration and invasive vegetation management work in the park and work to limit anthropogenic influences has minor, short-term, adverse effects on visitor experience from beach, trail, and dune closings while the park performs this work; however, minor, long-term, beneficial impacts on visitor experience result from an improved viewshed and a reduction in future closings for cyclic maintenance work.

Education and public outreach efforts to visitors by the park have a negligible, long-term, beneficial impact on visitor experience by helping visitors understand the importance of limiting social trails and other anthropogenic influences in the park. This results in fewer trail closings for maintenance and restoration work.

Proposed Management Actions

The proposed management actions described in "The Alternatives" chapter for the foredune and dune complex would have multiple impacts on visitor experience.

The park proposes to expand its education and outreach efforts about nonnative invasive plant species to visitors. Such efforts would result in negligible, long-term, beneficial impacts on visitor experience from the resultant reduction in anthropogenic influences in the park.

To address the apparent anthropogenic influences in the park, the park is considering realigning some trails and is developing a mitigation plan for new/proposed access points. Such actions would result in minor, short-term, adverse impacts on visitor experience during trail closings related to the construction activities associated with such work. These actions would also result in minor, long-term, beneficial impacts on visitor experience from new approved access points, which would result in less trampling of park vegetation by visitors (and thus reduced restoration work, which would equate to fewer trail closings for visitors.

Cumulative Impacts. Proposed construction by the park and surrounding areas and property owners, like the development projects proposed under Phase II of the Marquette Plan (IDNR *et al.* 2005), would have negligible to minor, short- and long-term, adverse impacts due to areas of the park being closed during construction, and from the visual intrusions that construction and construction equipment would introduce into the park, and the visual intrusion that new development would introduce to the natural viewshed of visitors in the park and surrounding areas. The Northern Indiana Commuter Transportation District (the South Shore Railroad), which currently traverses the park, introduces a visual intrusion of track and rail cars into the park, having a minor, long-term, adverse effect on visitor experience.

Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under visitor experience as a result of proposed management actions would be minor, short- and long-term, and adverse and beneficial. Minor, short-term, and adverse cumulative impacts would result from trail closings during construction and restoration efforts, and from the visual intrusions (e.g., construction equipment) that would be introduced in to the park during such work. Minor, long-term, beneficial impacts would result from reductions in future trail closings from reduced erosion and increased preservation and from increased visitor awareness and knowledge about park resources.

Conclusion. Impacts on the foredune and dune complex in reaches 1 through 4 under visitor experience as a result of proposed management actions would be negligible, long-term, and beneficial from expanded education and outreach efforts about nonnative invasive plant species and the resultant reduction in anthropogenic influences. Realigning trails and developing a mitigation plan for new/proposed access points would result in minor, short-term, adverse impacts on visitor experience during trail closings related to the construction activities associated with such work. Such actions would also result in minor, long-term, beneficial impacts on visitor experience from new improved access points, which would result in less trampling of park vegetation by visitors (thus reduced restoration work, which would equate to fewer future trail closings for visitors). Construction in the park would have negligible to minor, short- and long-term, adverse impacts due to areas of the park being closed temporarily during construction, and from the visual intrusions that construction and construction equipment would introduce into the park, and the visual intrusion that new development would introduce to the natural viewshed of visitors in the park and surrounding areas. The Northern Indiana Commuter Transportation District (the South Shore Railroad), which currently traverses the park, introduces a visual intrusion of track and rail cars into the park, having a minor, long-term, adverse effect on visitor experience. Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under visitor experience as a result of proposed management actions would be minor, short- and long-term, and adverse and beneficial.

PARK OPERATIONS

METHODOLOGY

"Park operations" refers to the ability of NPS staff to protect and preserve the resources of Indiana Dunes National Lakeshore and to provide opportunities for enjoyable visitor experiences. Park operations also relates to the effectiveness and efficiency with which NPS staff is able to perform such tasks. National Park Service operational data were compiled from various sources, including park staff, and included data on park staffing, maintenance, budgets, visitor use, funding, and park resource needs to assess the impacts of each of the alternatives being analyzed in this plan.

Intensity Level Definitions

Intensity thresholds of park operations are defined as follows:

Negligible: The impact is barely detectable and/or would result in no noticeable or perceptible changes in current park operations, staffing, and/or funding requirements.

Minor: The impact is slight but detectable and/or would result in small but noticeable changes in current park operations, staffing, and/or funding requirements.

Moderate: The impact is readily apparent and would result in easily detectable changes in current park operations, staffing, and/or funding requirements.

Major: The impact is severely adverse or exceptionally beneficial, and/or would result in appreciable changes in current park operations, staffing, and/or funding requirements.

SHORELINE AND BEACH COMPLEX, REACHES 1 AND 2

Alternative A (No-action Alternative)

Under the no-action alternative, park operations would continue as described in the "Affected Environment" chapter. The park is considering realigning some trails, as well as developing a mitigation plan for new/proposed access points to limit the anthropogenic influences witnessed in the park. Such efforts would have a minor, short-term, adverse impact on park operations due to the staff hours required for developing, planning, and implementing such plans and construction; however, there would also be minor, long-term, beneficial impacts from improved natural conditions in the park and less vegetation trampling, subsequently resulting in fewer routine maintenance and upkeep demands on park staff.

Assuming current funding trends continue and staffing levels remain similar to present levels, the park would be unable to fully achieve desired conditions in program areas such as resource protection and visitor services. Actions associated with the no-action alternative would have minor, long-term, adverse impacts on park operations, but there would be no new impacts.

Cumulative Impacts. Under the no-action alternative, ongoing and planned facility upgrades would have negligible, short-term, adverse impacts on park operations due to the increased demands placed on park staff and operating budgets during planning and construction; however, these upgrades would result in negligible, long-term, beneficial impacts from the increased operating efficiencies that typically come with such upgrades. Similar impacts would result from proposed new development, like the picnic area near the Porter access point that the park is considering.

Resource protection and restoration projects, like the early detection and rapid response program and Invasive Plant Management Plan, would result in minor, long-term, beneficial impacts from increased resource protection and stability that would decrease demands on park operations for maintenance and restoration efforts. Such projects would also pose a minor, short-term, adverse impact on park operations due to the increased demands placed on park staff during planning, development, and implementation of such programs and plans. Monitoring the long-term effects and successfulness of such programs would pose a minor, long-term, adverse impact on park staff due to ongoing monitoring and documentation of each plan's success, adding to the park staff's existing workloads. Cyclic maintenance needs would decrease through restoring the park's native vegetation mix by decreasing the presence of nonnative species in the park, thus having a minor, long-term, beneficial impact on park operations due to the decreased maintenance workload.

Minor, long-term, adverse impacts would occur from the current beach nourishment program that includes sediment being accepted in reach 1 from upland sources. This places demands on park maintenance staff and operating budgets.

Special events, like the annual Super Boat Grand Prix, have minor, short-term, adverse impacts on park operations due to the event planning and execution that is required of park staff for such events.

Under the no-action alternative, the proposed plan would incrementally add negligible to minor short- and long-term, adverse and beneficial effects on park operations. When combined with other past, present, and reasonably foreseeable future actions, park operations would experience overall minor, short- and long-term, adverse and beneficial impacts.

Conclusion. The impact of taking no new actions in the park and continuing with the existing beach nourishment program that includes sediment being accepted in reach 1 from upland sources would be minor, long-term and adverse. Ongoing impacts would continue, even though the no-action alternative would have no new impacts on park operations. When considered with other past, present, and reasonably foreseeable future actions, the proposed plan would incrementally add to cumulative impacts on park operations, having an overall negligible, minor, short- and long-term, adverse and beneficial impact.

Alternative B-1 (Beach Nourishment via Upland Sources, Annual Frequency)

Beach nourishment via upland sources with an annual frequency would require additional staff time to monitor and oversee this action, placing additional demands on park staff and budgets from added responsibilities related to planning, communication, and monitoring over approximately four months each year, resulting in minor, short-term, adverse effects on park operations. The actions associated with alternative B-1 would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, and result in minor, short-term, beneficial impacts on park operations from reduced cyclic maintenance and restoration demands for up to a year. The shorelines downdrift of Mount Baldy would receive an infusion of sediment from these beach nourishment activities, impacting not only reach 1, but reach 2 and a portion of reach 3, as well, similarly reducing cyclic maintenance and restoration demands in those areas, resulting in minor, short-term, beneficial impacts on park operations from reduced maintenance workloads.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative B-1. Compared to the cumulative impacts expected under the no-action alternative, under alternative B-1, these differences in

relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor, long-term and beneficial under alternative B-1 due to the long-term reductions in workloads from reduced maintenance requirements. Cumulative impacts would also be minor, short-term, and adverse from short-term increases in staff workloads during the annual four-month period of nourishment activities. The actions associated with alternative B-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative B-1, there would be minor, short-term, adverse impacts on park operations from the increased demands that would be placed on park staff and budgets annually. There would also be minor, short-term, beneficial impacts from the resulting reductions in annual cyclic maintenance and restoration work that the park performs. The actions of this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term and adverse and beneficial, cumulative effects.

Alternative B-5 (Beach Nourishment via Upland Sources, Five-Year Frequency)

Beach nourishment activities and impacts under alternative B-5 would be similar to those described above under alternative B-1, with a few differences. Under alternative B-5, beach nourishment would take place once every five years with nourishment activities taking approximately 18 months to complete. Moderate, long-term, adverse impacts would result from the additional demands that would be placed on park staff and budgets from increased responsibilities over an approximate 18-month period related to planning, communication, and monitoring; and minor, long-term, beneficial impacts would also result from reduced cyclic maintenance and restoration as a result of decreased erosion.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative B-5. Compared to the cumulative impacts expected under the no-action alternative, under alternative B-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term and adverse and beneficial from the increases in park staff workloads to implement the actions associated with alternative B-5 and from the reduced cyclic maintenance demands that would result over the five-year. The actions associated with alternative B-5 would provide a substantial incremental contribution to overall cumulative impacts.

Conclusion. Under alternative B-5, there would be moderate, long-term, adverse impacts from the additional planning, execution, and monitoring tasks that would tax employees and operating budgets for approximately 18 months every five years during beach nourishment activities; however, there would also be minor, long-term, beneficial impacts from reduced cyclic maintenance and restoration demands on park staff and park dollars over each five-year period. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term and adverse and beneficial, cumulative effects.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency)

Under alternative C-1, sediment would be dredged from an updrift location and placed on the beach in reach 1 over an approximate two-month period every year. These activities would place additional demands on park staff from added responsibilities related to planning, communication, and monitoring. This would result in minor, short-term,

adverse effects on park operations. The actions associated with alternative C-1 would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, and would result in minor, short-term, beneficial impacts on park operations from reduced cyclic maintenance and reduced restoration demands. The shorelines downdrift of Mount Baldy would receive an infusion of sediment from these beach nourishment activities, impacting not only reach 1, but reach 2 and a portion of reach 3, as well, similarly reducing cyclic maintenance and restoration demands in those areas, and having a minor, short-term, beneficial impact on park operations.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-1. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-1, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor, short- and long-term and adverse and beneficial from the decrease in annual maintenance demands to restore the park shoreline and from the increase in park staff workloads during the approximate two-month nourishment period each year. The actions associated with alternative C-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-1, there would be minor, short-term, adverse impacts on park operations from the increased demands that would be placed on staff and budgets each year during the approximate two-month period for beach nourishment activities each year. Under this alternative, there would also be minor, short-term, beneficial impacts park operations from the annual decrease in maintenance and restoration work required by park staff and of park budgets. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term and adverse and beneficial, cumulative effects.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency)

Beach nourishment activities and impacts on park operations under alternative C-5 would be similar to those described above under alternative C-1, with a few differences. Under alternative C-5, beach nourishment activities would take place every five years versus annually, and dredging activities would take approximately 10 months to complete every five years. Impacts under this alternative would be moderate, short-term and adverse from the additional demands that would be placed on park staff for planning, communication, and monitoring for an approximate 10-month period every five year; and minor, long-term and beneficial from the reduced cyclic maintenance and reduced restoration demands that would result from decreased erosion.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-5. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term and adverse and beneficial from the decrease in park staff workloads to address shoreline beach erosion every five years, and from the short-term increase in staff workloads and additional demands on park operating budgets for the nourishment that would occur over approximately 10 months every five years. The actions associated with alternative C-5 would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-5, there would be moderate, short-term, adverse

impacts on park operations from the demands the associated activities would place on park staff and budgets. There would also be minor, long-term, beneficial impacts from the resulting decrease in cyclic maintenance and restoration work performed in the park from the decrease in erosion. The actions of this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term, adverse and beneficial, cumulative effects.

Alternative D (Beach Nourishment via Permanent Bypass System)

Under alternative D, sediment would be transported via a permanent bypass system from updrift of the Michigan City Harbor to reach 1. This beach nourishment activity would place additional demands on park staff from added responsibilities related to planning, communication, construction, and monitoring. This would result in minor to moderate, short-term, adverse effects on park operations from the increase in staff workloads and the burden that would be placed on operating budgets. In addition, following construction, the permanent bypass system would require monitoring and routine maintenance, adding to existing park staff workloads, resulting in minor to moderate, long-term, adverse impacts on park operations. The actions associated with alternative D would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, resulting in minor, short-term, beneficial impacts on park operations from reduced cyclic maintenance and reduced restoration demands. The shorelines downdrift of Mount Baldy would receive an infusion of sediment from the beach nourishment activities associated with alternative D, impacting not only reach 1, but reach 2 and a portion of reach 3, as well, similarly reducing cyclic maintenance and restoration demands in those areas.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative D. Compared to the cumulative impacts expected under the no-action alternative, under alternative D, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor, short- and long-term and adverse and beneficial from the reduction in annual maintenance demands of the shoreline related to erosion, and from the short-term increase in workloads and operating budget demands related to the nourishment activities. The actions associated with alternative D would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative D, there would be minor to moderate, short- and long-term, adverse impacts on park operations from the increase in park staff responsibilities and the increased demand placed on the park's operating budget to carry out the actions associated with alternative D beach nourishment, especially the routine monitoring and maintenance of the permanent bypass system for the life of this plan. There would also be minor, short-term, beneficial impacts under this alternative from the decrease in maintenance and restoration work that would result from the decrease in erosion that would occur from the annual beach nourishment activities. The actions of this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term and adverse and beneficial, cumulative effects.

Alternative E (Submerged Cobble Berm and Beach Nourishment, Annual Frequency)

Under alternative E, the one-time construction of the submerged cobble berm would place additional workload demands on park staff during planning and construction, resulting in minor, short-term, adverse effects

on park operations that would last only as long as construction. Over time, the submerged cobble berm would facilitate stabilization of the shoreline and reduce the quantity of sediment needed for beach nourishment along this reach, resulting in moderate, long-term, beneficial impacts on park operations from reduced operating budgets over the proposed plan's lifespan and beyond (from fewer nourishment activities being performed, improved erosion barriers, and fewer maintenance and restoration demands). The actions associated with alternative E would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, resulting in moderate, long-term, beneficial impacts on park operations from reduced cyclic maintenance and restoration demands.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative E. Compared to the cumulative impacts expected under the no-action alternative, under alternative E, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be moderate, short- and long-term and adverse and beneficial from the reduced maintenance demands related to shoreline erosion over the life of the plan and from the temporary increase in park staff workloads during construction and placement of the submerged cobble berm. The actions associated with alternative E would provide a large incremental contribution to overall cumulative impacts, adverse in the short-term during construction, but beneficial over the long-term.

Conclusion. Under alternative E, there would be minor, short-term, adverse impacts on park operations during construction of the submerged cobble berm; and moderate, long-term, beneficial impacts on park operations from the reduced maintenance demands, reduced restoration demands, and lower operating budgets over the life of the plan. The actions associated with this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have moderate, short- and long-term and adverse and beneficial, cumulative effects.

Alternative F (Beach Nourishment, Annual Frequency with a Mix of Small Natural Stone at the Shoreline) – Preferred Alternative

Under alternative F, sediment would be dredged from an updrift location and coarse material and small native stones would be trucked from an upland source and placed on the beach in reach 1. These activities would place additional demands on park staff from added responsibilities related to planning, communication, and monitoring. This would result in minor, short-term, adverse effects on park operations. The actions associated with alternative F would fulfill the sediment budget deficit calculated for reach 1, preventing additional erosion, and would result in minor, short-term, beneficial impacts on park operations from reduced cyclic maintenance and reduced restoration demands. The shorelines downdrift of Mount Baldy would receive an infusion of sediment from these beach nourishment activities, impacting not only reach 1, but reach 2 and a portion of reach 3, as well, similarly reducing cyclic maintenance and restoration demands in those areas, and having a minor, short-term, beneficial impact on park operations.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative F. Compared to the cumulative impacts expected under the no-action alternative, under alternative F, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor, short- and long-term and adverse and beneficial from the decrease in annual maintenance demands to restore the park shoreline and from the increase in park staff

workloads during the approximate two-month beach nourishment period each year. The actions associated with alternative F would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative F, there would be minor, short-term, adverse impacts on park operations from the increased demands that would be placed on staff and budgets each year during the approximate two-month period for beach nourishment activities each year. Under this alternative, there would also be minor, short-term, beneficial impacts park operations from the annual decrease in maintenance and restoration work required by park staff and of park budgets. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term and adverse and beneficial, cumulative effects.

SHORELINE AND BEACH COMPLEX, REACHES 3 AND 4

Alternative A (No-action Alternative)

Under the no-action alternative for reaches 3 and 4, park operations would continue to be characterized and impacted as explained under the no-action alternative above for reaches 1 and 2 and no new actions would be taken. Assuming current funding trends continue and staffing levels remained similar to present levels, the park would continue to be unable to fully achieve desired conditions in program areas such as resource protection, visitor services, and cyclic maintenance. The existing beach nourishment program would continue to impact the industrial warm-water discharge location, extending it east towards the park shoreline, impacting aquatic and terrestrial habitats, requiring increased dredging of the federal channel. Such actions would continue to add to the workloads of park staff and increase the operating budget requirements, resulting in minor, long-term, adverse effects on park operations. In addition, excessive sedimentation around the intake would inhibit the use of the cold-water intake structure, resulting in potential emergency plant shutdowns, imposing additional workloads on park staff and increasing cyclic maintenance demands, resulting in minor, long-term, adverse effects on park operations. Actions associated with the no-action alternative would have minor, long-term, adverse impacts on park operations, but there would be no *new* impacts.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative for reaches 1 and 2 would also apply under alternative A in reaches 3 and 4. Under the no-action alternative, the proposed plan would incrementally add a negligible to minor, short- and long-term, beneficial and adverse effect on park operations. When combined with other past, present, and reasonably foreseeable future actions, park operations would experience overall minor, short- and long-term, adverse and beneficial impacts, but there would be no new impacts.

Conclusion. The impacts associated with taking no new actions in the park and continuing with the existing dredging that is performed for beach nourishment in reach 3 would be minor, long-term and adverse from the growing workload demands and maintenance operations that would be required. Ongoing impacts would continue, even though the no-action alternative would have no *new* impacts on park operations. When considered with other past, present, and reasonably foreseeable future actions, the proposed plan would incrementally add to cumulative impacts on park operations, having an overall negligible to minor, short- and long-term, adverse and beneficial impact.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency) – Preferred Alternative

Beach nourishment activities and impacts under the preferred alternative in reaches 3 and 4 would be similar to those described above under alternative C-1 for reaches 1 and 2. That is, moderate, short-term, adverse impacts from the added responsibilities that would be placed on park staff for planning, communication, and monitoring of the beach nourishment activities that would take place each year over an approximate two-month period; and minor, short-term, beneficial impacts from reduced cyclic maintenance and reduced restoration demands. The actions associated with alternative C-1 would fulfill the sediment budget deficit estimated for reach 3, preventing additional erosion, resulting in minor, short-term, beneficial impacts on park operations from reduced cyclic maintenance and restoration demands. The shoreline downdrift of Portage Lakefront and Riverwalk would receive an infusion of sediment from these beach nourishment activities, impacting reach 4, similarly reducing cyclic maintenance and restoration demands in that reach.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-1. Compared to the cumulative impacts expected under the no-action alternative, under alternative C-1, these differences in relation to past, present, and reasonably foreseeable future projects would result in a small difference. Cumulative impacts would be minor, short- and long-term and adverse and beneficial from the short-term demands placed on park staff and park operating budgets during beach nourishment activities, and from the short-term, annual reduction in maintenance/restoration work. The actions associated with alternative C-1 would provide a small incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-1, there would be minor, short-term, adverse impacts on park operations from the additional demands that would be placed on park staff and park operating budgets to plan and carry out the required actions annually over an approximate two-month period. There would also be minor, short-term, beneficial impacts from the savings and decreased workloads that would result from the reduced maintenance and restoration demands that would result with less shoreline erosion. This alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor, short- and long-term and adverse and beneficial, cumulative effects.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency)

Beach nourishment activities and impacts on park operations under alternative C-5 would be similar to those described above under alternative C-1, with a few differences. Impacts under this alternative would be minor to moderate, short-term and adverse from the additional demands that would be placed on park staff for planning, communication, and monitoring; and minor, long-term and beneficial from the reduced cyclic maintenance and reduced restoration demands that would result from decreased shoreline erosion. Under alternative C-5, the dredging of sediment would take place every five years rather than annually, and dredging every five years would take approximately six months to complete, resulting in minor to moderate, short-term, adverse effects on park operations from the additional coordination and planning efforts park staff would need to perform to carry out the actions associated with this alternative.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative C-5. Compared to the cumulative impacts

expected under the no-action alternative, under alternative C-5, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term and adverse and beneficial from the short-term demands on park staff and park operating budgets to carry out this work and the benefits that would be realized through decreased erosion and related maintenance/restoration work. The actions associated with alternative C-5 would provide a substantial incremental contribution to overall cumulative impacts.

Conclusion. Under alternative C-5, there would be minor to moderate, short-term, adverse impacts on park operations from the additional demands that would be placed on park staff and park budgets (for approximately six months every five years) to carry out the actions associated with this alternative. There would also be minor, long-term, beneficial impacts from the reductions in maintenance and restoration work as the actions associated with this alternative would decrease erosion in the park. The actions of this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term and adverse and beneficial, cumulative effects.

Alternative D (Beach Nourishment via Permanent Bypass System)

Under alternative D in reaches 3 and 4, the actions and impacts would be similar to those described above under alternative D for reaches 1 and 2. That is, minor, short-term, adverse effects on park operations from the increase in staff workloads and the burden that would be placed on operating budgets related to planning, communication, construction, and monitoring; and minor to moderate, long-term, adverse impacts from the monitoring and routine maintenance demands that would be placed on park staff to maintain the permanent bypass system. The actions associated with alternative D would fulfill the sediment budget deficit estimated for reach 3, preventing additional erosion, resulting in minor, short-term, beneficial impacts on park operations from reduced cyclic maintenance and reduced restoration demands. The shorelines downdrift of reach 3 would receive an infusion of sediment from the beach nourishment activities associated with this alternative, impacting reach 4, reducing cyclic maintenance and restoration demands in that area as well.

Cumulative Impacts. The same scenario of past, present, and reasonably foreseeable future actions described under the no-action alternative would also apply under alternative D. Compared to the cumulative impacts expected under the no-action alternative, under alternative D, these differences in relation to past, present, and reasonably foreseeable future projects would result in a large difference. Cumulative impacts would be minor to moderate, short- and long-term and adverse and beneficial from the short-term impacts on park staff workloads and operating budgets during the construction of the permanent bypass system and the long-term monitoring and maintenance of the permanent bypass system for the life of this plan. The actions associated with alternative D would provide a large incremental contribution to overall cumulative impacts.

Conclusion. Under alternative D, there would be minor to moderate, short- and long-term, adverse impacts on park operations from the additional staff time and operating dollars the associated beach nourishment actions would require, especially the routine monitoring and maintenance of the permanent bypass system for the life of this plan. There would also be a minor, short-term, beneficial impact from the associated erosion decrease and resultant decrease in required maintenance and restoration work by park staff (reducing operating budget drains). The actions of this alternative, when combined with other past, present, and reasonably foreseeable future actions, would have minor to moderate, short- and long-term and adverse and beneficial, cumulative effects.

FOREDUNE AND DUNE COMPLEX, REACHES 1 THROUGH 4

Current Management Actions

The current management actions described in "The Alternatives" chapter for the foredune and dune complex have multiple impacts on park operations.

Current actions to maintain/preserve/restore areas of the park from invasive vegetation and anthropogenic influences, like fencing off highly eroded areas, revegetating eroded areas with native seeds, and conducting visitor education and outreach efforts, have a negligible, short-term, adverse effect on park operations from the workloads these actions require of staff and from the drain on operating budgets. These actions also have a minor, long-term, beneficial impact on park operations from reduced future work requirements related to preserving the foredune and dune complex and reducing anthropogenic influences in the park.

Existing beach nourishment activities in reaches 1 and 3 have a minor, long-term, adverse effect on park operations from the ongoing commitment of park staff and dollars to these efforts.

Education and outreach activities have negligible, short-term, adverse impacts on park operations due to the resource commitments they require; however, such activities also have a negligible to minor, long-term, beneficial impact from reduced cyclic maintenance and invasive vegetation management work as anthropogenic influences are reduced.

Proposed Management Actions

The proposed management actions described in "The Alternatives" chapter for the foredune and dune complex would have multiple impacts on park operations.

The park proposes to expand its education and outreach efforts about the impacts of invasive nonnative plant species and anthropogenic influences in the park. This would have negligible, short-term, adverse impacts on park operations from the additional park resources this would require; however, there would also be negligible to minor, long-term, beneficial impacts from a better educated visitor population and a resultant decrease in anthropogenic influences in the park.

To address the apparent anthropogenic influences in the park, the park is considering realigning some trails and is developing a mitigation plan for new/proposed access points and trails to Crescent Dune. Such actions would result in minor, short-term, adverse impacts on park operations due to increased workloads and additional operating budget drains to plan, design, and construct/implement trail realignments. In addition, there would be minor, long-term, beneficial impacts on park operations from decreased demands on park staff for cyclic maintenance and restoration after trails were realigned. Development of a mitigation plan for new/proposed access points in reach 1 would have negligible, short- and long-term, adverse impacts on park operations from increased workloads to develop, implement, and monitor the success of such a plan; however, there would also be minor, long-term, beneficial impacts on park operations from reduced cyclic maintenance demands and reduced restoration requirements in this area over the long-term.

Cumulative Impacts. Proceeding with proposed developments, like a picnic area near the Porter access point or other development projects proposed in Phase II of the Marquette Plan (IDNR *et al.* 2005), would have minor, short-term, adverse impacts on park operations because of the additional work demands that would be placed on park staff to plan, develop, and construct such facilities. Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under park operations as a result of proposed

management actions would be minor, short- and long-term, and adverse and beneficial from the short-term impacts on park staff workloads and operating budgets during planning, coordinating, and construction efforts related to the proposed management actions, and the long-term benefits of reduced future maintenance and restoration work.

Conclusion. Impacts on the foredune and dune complex in reaches 1 through 4 under park operations as a result of proposed management actions would be negligible, short-term, and adverse from expanding education and outreach efforts about the impacts of invasive nonnative plant species and anthropogenic influences in the park because such activities would require park staff time; however, there would also be negligible to minor, long-term, beneficial impacts from a better educated visitor population and a resultant decrease in anthropogenic influences in the park. Realigning some trails and developing a mitigation plan for new/proposed access points and trails to Crescent Dune would result in minor, short-term, adverse impacts on park operations due to increased workloads and additional operating budget drains to plan, design, and construct/implement trail realignments. In addition, there would be minor, long-term, beneficial impacts on park operations from decreased demands on park staff for maintenance and restoration work after trails were realigned. Development of a mitigation plan for new/proposed access points in reach 1 would have negligible, short- and long-term, adverse impacts on park operations from increased workloads to develop, implement, and monitor the success of such a plan; however, there would also be minor, long-term, beneficial impacts on park operations from reduced cyclic maintenance demands and reduced restoration requirements over the long-term. Proceeding with proposed developments would have minor, short-term, adverse impacts on park operations because of the additional work demands that would be placed on park staff to plan, develop, and construct such facilities. Cumulative impacts on the foredune and dune complex in reaches 1 through 4 under park operations as a result of proposed management actions would be minor, short- and long-term, and adverse and beneficial.

SUMMARY OF IMPACT ANALYSIS

UNAVOIDABLE ADVERSE IMPACTS

The National Park Service is required to consider if the alternative actions of a proposed action would result in adverse impacts that would not be fully mitigated or avoided. A summary of unavoidable adverse impacts is presented below by reach and alternative.

Reaches 1 and 2

Alternative A (No-action Alternative). Under the no-action alternative, erosion of the shoreline would continue to occur in reach 1, threatening aquatic and terrestrial habitats and the sediment budget deficit would also continue, resulting in a deficit of material for foredune and dune formation. Taking no new actions in the park would result in continued erosion and destabilization of terrestrial habitat for plants and animals (thus adversely affecting threatened and endangered species and species of concern, as well) and would not improve the ability of the beach to withstand storm events. Short-term, adverse impacts on the natural soundscape would continue during current beach nourishment activities and during high-use times (e.g., summer weekends and holidays) under the no-action alternative. Visitors would continue to be adversely impacted by ongoing beach nourishment activities under the no-action alternative from the continued temporary beach closings and ongoing degradation of popular visitor amenities from shoreline erosion. Aquatic fauna would continue to be adversely affected under the no-action alternative from temporary displacement due to turbidity and the benthic fauna that would be smothered during placement of sediment; additionally, current nourishment activities would result in a disrupted environment which would continue to allow for the introduction/establishment of invasive and nonnative aquatic species. Under the no-action alternative, park operations would continue to be adversely impacted as a result of the ongoing workload demands and maintenance costs associated with existing beach nourishment activities and shoreline erosion.

Alternative B-1 (Beach Nourishment via Upland Sources, Annual Frequency). Under alternative B-1, adverse impacts on terrestrial habitat for plants and animals and on threatened and endangered species and species of concern would result from the introduction of invasive and nonnative plant species. The natural soundscape of the park would be adversely impacted on a temporary basis from the beach nourishment activities related to this alternative, including the trucks hauling sediment and the construction equipment grading the nourishment material along the beach. Native aquatic fauna would be adversely impacted by the actions associated with alternative B-1 as fish would be temporarily displaced due to turbidity and benthic fauna would be temporarily smothered during placement of sediment. Nourishment activities would result in a disrupted environment which would allow for the introduction and/or establishment of invasive and nonnative aquatic fauna species. Visitor experience would be affected adversely on a short-term basis from temporary beach and trail closings for nourishment activities in reach 1 and the visual intrusions that would be introduced in to the park (e.g., construction and grading equipment). The actions associated with alternative B-1 would have an adverse impact on park operations from the increased demands that would be placed on park staff and park budgets annually.

Alternative B-5 (Beach Nourishment via Upland Sources, Five-Year Frequency). The actions associated with alternative B-5 would be similar to those under alternative B-1 except actions would result in long-term, adverse impacts on aquatic and terrestrial habitat for plants and animals, threatened and

endangered species and species of concern, the natural soundscape, visitor experience, and park operations as beach nourishment activities would last for approximately 18 months every five years. In addition, the placement area would have a larger footprint than under alternative B-1 due to the larger volume of material that would be placed. Under alternative B-5, fish life-cycles would be interrupted due to the longer duration (approximately 18 months every five years) for nourishment placement.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency). Under Alternative C-1, short-term, adverse impacts on the natural aquatic and terrestrial habitats for plants and animals, threatened and endangered species and species of concern, the park soundscape, visitor experience, and park operations would occur during the beach nourishment activities.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five-Year Frequency). Under Alternative C-5, there would be short-term, adverse impacts on terrestrial habitat for plants and animals, threatened and endangered species and species of concern, the natural soundscape of the park, aquatic fauna, visitor experience, and park operations. There would also be long-term adverse impacts on native aquatic fauna from the duration (approximately 10 months every five years) of placement activities (i.e., fish would be displaced for under a year but fish life cycles would be interrupted).

Alternative D (Beach Nourishment via Permanent Bypass System). Under alternative D, short-term, adverse impacts on the natural aquatic and terrestrial habitats for plants and animals, as well as the park soundscape, threatened and endangered species and species of concern, visitor experience, and park operations would occur during ongoing beach nourishment activities and during construction of the permanent bypass system. Long-term adverse impacts would also result from the actions associated with this alternative from the visual intrusion the small lift stations would introduce in to the park, and from the additional staff time and operating dollars the routine monitoring and maintenance of the permanent bypass system would require.

Alternative E (Submerged Cobble Berm and Beach Nourishment, Annual Frequency). Under alternative E, there would be short-term, adverse impacts on the natural aquatic and terrestrial habitats for plants and animals, the park soundscape, threatened and endangered species and species of concern, visitor experience, and park operations during the construction of the submerged cobble berm, as well as during beach nourishment activities. There would also be long-term adverse impacts from the visual intrusion the submerged cobble berm would introduce into the park and the safety concerns it would pose to boaters before dissipation (though the park would consider implementing mitigation measures to offset these safety concerns).

For the impacts mentioned above for reaches 1 and 2, the mitigation measures described in "The Alternatives" chapter, would help minimize, but not eliminate, these impacts.

Alternative F (Beach Nourishment, Annual Frequency with a Mix of Small Natural Stone at the Shoreline) – Preferred Alternative. Under the preferred alternative, there would be short-term, adverse impacts on the natural aquatic and terrestrial habitats for plants and animals, the park soundscape, threatened and endangered species and species of concern, visitor experience, and park operations during beach nourishment activities.

For the impacts mentioned above for reaches 1 and 2, the mitigation measures described in "The Alternatives" chapter, would help minimize, but not eliminate, these impacts.

Reaches 3 and 4

Alternative A (No-action Alternative). Under the no-action alternative, erosion of the shoreline would continue to occur in reach 3, threatening aquatic and terrestrial habitats and the sediment budget deficit would also continue, resulting in a deficit of material for foredune and dune formation. Taking no new actions in the park would result in continued erosion and destabilization of terrestrial habitat for plants and animals (thus adversely affecting threatened and endangered species and species of concern, as well) and would not improve the ability of the beach to withstand storm events. Short-term, adverse impacts on the natural soundscape would continue during current beach nourishment activities and during high-use times (e.g., summer weekends and holidays) under the no-action alternative. Visitors would continue to be adversely impacted by ongoing beach nourishment activities from the temporary beach closings and ongoing degradation of popular visitor amenities that result from shoreline erosion. Aquatic fauna would continue to be adversely affected under the no-action alternative from temporary displacement due to turbidity and the benthic fauna that would be smothered during placement of sediment; additionally, current nourishment activities would result in a disrupted environment which would continue to allow for the introduction and/or establishment of invasive and nonnative aquatic species. Park operations would continue to be adversely impacted from the ongoing workload demands and maintenance costs associated with existing beach nourishment activities and shoreline erosion.

Alternative C-1 (Beach Nourishment via Dredged Sources, Annual Frequency) – Preferred Alternative. Under alternative C-1, short-term, adverse impacts on the natural aquatic and terrestrial habitats for plants and animals, threatened and endangered species and species of concern, park soundscape, visitor experience, and park operations would occur during the beach nourishment activities.

Alternative C-5 (Beach Nourishment via Dredged Sources, Five Year Frequency). Under alternative C-5, there would be short-term, adverse impacts on terrestrial habitat for plants and animals, threatened and endangered species and species of concern, the natural soundscape of the park, aquatic fauna, visitor experience, and park operations. There would also be long-term adverse impacts on native aquatic fauna from the duration (approximately six months every five years) of placement activities (i.e., fish would be displaced for under a year but fish life cycles would be interrupted).

Alternative D (Beach Nourishment via Permanent Bypass System). Under alternative D, short-term, adverse impacts on the natural aquatic and terrestrial habitats for plants and animals, as well as the park soundscape, threatened and endangered species and species of concern, visitor experience, and park operations would occur during ongoing beach nourishment activities and during construction of the permanent bypass system. Long-term adverse impacts would also result from the actions associated with this alternative from the visual intrusion the small lift stations would introduce in to the park, from the additional staff time and operating dollars the routine monitoring and maintenance of the permanent bypass system would require.

For the impacts mentioned above for reaches 3 and 4, the mitigation measures listed in "The Alternatives" chapter would help minimize, but not eliminate, these impacts.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The National Park Service is required to consider if its actions involve an irreversible or irretrievable commitment of resources. A resource commitment is irreversible if it results in loss of resources that cannot be reversed, except perhaps in the extreme long term. Irreversible impacts involve use of and impacts on a non-renewable resource (or a

resource renewable only over a long period of time) such that future options for use of that resource are limited. Irretrievable commitments of resources are actions that result in the loss of resources or the consumption of resources that are not renewable or recoverable for future use.

Reaches 1 through 4

For all alternatives presented in this plan / final EIS there would be an irreversible and irretrievable commitment of resources associated with shoreline restoration activities.

Energy Resources. Energy resources utilized for the proposed action alternatives would be irreversibly lost. These include petroleum-based products (such as gasoline and diesel) and electricity. During shoreline restoration activities, gasoline and diesel would be used for the operation of heavy equipment, barges, haul trucks, and maintenance vehicles. During terrestrial habitat restoration activities, gasoline would be used for the operation of private and government-owned vehicles. Consumption of these energy resources would not place a substantial demand on these resources or on the availability of them in the region. Therefore, no major impacts would occur.

Human Resources. The use of human resources for shoreline and terrestrial restoration activities would be an irretrievable loss, only in that it would preclude such personnel from engaging in other work activities. The use of human resources for the proposed action would also represent employment opportunities, and would be considered beneficial.

Soil Resources. The loss of soils and sediment due to erosion would be an irreversible commitment of resources under each of the action alternatives presented because it takes so long for soils to form. The proposed action alternatives would also lessen the erosive loss of soils compared to the loss that would occur under the no-action alternatives, and would be considered beneficial in the long-term.

RELATIONSHIP OF SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

The National Park Service is required to consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. In doing so, the National Park Service considers the long-term impacts of its actions, and whether its actions involve tradeoffs between immediate use of resources and long-term productivity and sustainability of resources. This analysis examines whether the productivity of park resources would be traded for the immediate use of land.

Reaches 1 through 4

Under any of the action alternatives, the National Park Service would continue to manage the park and its shoreline to maintain ecological processes and native biological communities and to provide appropriate recreational and visitor use opportunities consistent with preservation of natural resources. The park's resources would continue to be protected in their current, relatively natural state to the greatest extent possible, and would maintain their long-term productivity. The primary short-term uses of the shoreline would continue to be recreational/visitor uses.

Under the no-action alternative, continuing adverse impacts on the shoreline and beach and aquatic and terrestrial habitats due to erosion would reduce the productivity of natural resources and processes in localized areas over time, resulting in a large effect on the park's long-term productivity as the erosion of the shoreline would threaten the integrity of natural resources.

Under the action alternatives presented in this plan / final EIS, these management actions would be implemented to restore coastal and natural processes and terrestrial habitat. Although there would be short- and long-term, adverse impacts that would result from the localized loss of aquatic fauna and terrestrial habitat, overall, no noticeable effect on the park's long-term productivity would result. Conversely, the actions proposed would restore the shoreline and would increase long-term productivity of the shoreline environment through natural processes.

CHAPTER 5
Consultation and Coordination

PUBLIC INVOLVEMENT, INCLUDING SCOPING

The National Park Service actively engaged the public, stakeholders, and government officials at the federal, state, and local levels throughout the planning process. Scoping is an early and open process for determining the scope of a proposed action or project and for identifying issues related to the project. During scoping, NPS staff provides an overview of the project, including the purpose and need, in addition to preliminary issues. The public is then asked to submit comments, concerns, and suggestions relating to the project and preliminary issues. The public had three primary avenues for participating during the development of this *Shoreline Restoration and Management Plan / Draft Environmental Impact Statement* (EIS): 1) attending a public meeting and providing comment verbally or by submitting a comment form; 2) responding to the information contained in park newsletters that contained information and updates about the project; and 3) providing comments via mail, and by electronic submission through the NPS planning website.

The public was notified of this Indiana Dunes National Lakeshore planning effort via: (1) a *Federal Register* notice of intent (volume 75, number 137) to prepare an EIS, dated July 19, 2010; (2) distribution of two newsletters for this effort in December 2010 and May 2011; and (3) a press release announcing a public comment opportunity, including public scoping meetings for the plan / draft EIS.

PUBLIC SCOPING MEETINGS

To kick off this plan / draft EIS, four public scoping meetings were held on December 8, 9, 15, and 16, 2010 in open house format. The meetings were announced by postcard, email, and a press release. The *Post-Tribune* published an article about the meetings on December 1, 2010. In total, 65 members of the public and three reporters attended the meetings. The meetings were held at the Northwest Indiana Regional Planning Commission in Portage, the Lubeznik Center for The Arts in Michigan City and at the Indiana Dunes National Lakeshore Visitor Center in Porter, Indiana. The purpose of the public scoping meetings was to:

- present basic information and data about the park
- identify the purpose and need of the project and its objectives
- describe the guidelines for restoration endpoints within the park
- discuss potential management strategies for approaching the proposed project
- outline the planning / National Environmental Policy Act of 1969, as amended (NEPA) process

The preliminary project area boundary and an array of shoreline restoration tools were also presented to the public by park staff during the public scoping meetings. After a brief introduction about the project, participants were invited to visit/tour informational stations set up around the meeting rooms and discuss the plan / draft EIS with NPS project team members. During the December meetings participants were offered comment cards and *Newsletter #1*.

During the meetings many members of the public expressed support for soft or natural shoreline restoration tools. The public's main concerns were protecting habitat, maintaining a natural viewshed, and not causing additional disruptions to sediment movement in the area. Other meeting attendees expressed support for hard or man-made shoreline restoration tools, citing the need for a long-term solution that would protect homes and public infrastructure along the shoreline. Shoreline restoration tools that were mentioned/ recommended by the public included sediment bypass systems and various approaches to dredging.

Several meeting participants discussed their understanding of sediment movement and their personal experiences related to sediment movement with members of the NPS project team. The unknown effects of climate change were also mentioned in relationship to extreme storm weather events, lake levels, and coastal processes.

Comment Cards, Offered During the December 2010 Public Scoping Meetings

Comment cards offered to the public at the public scoping meetings asked participants to respond to the following questions:

- What are the most important shoreline restoration and management issues?
- What are the most important ecological issues along the shoreline and foredunes?
- Which shoreline restoration and management tools should the National Park Service consider?
- Which shoreline restoration and management tools should the National Park service not consider?
- Do you have any other comments or concerns about the plan / draft EIS the National Park service should consider?

See the "Public Scoping Meetings" section of the "Consultation and Coordination" chapter for a summary of the comments received.

Newsletter #1, Issued During December 2010 Public Scoping Meetings

Newsletter #1 was issued during the public scoping meetings in December 2010 and invited readers to comment in person, via mail, or online using the NPS website. *Newsletter #1* provided the following information:

- the purpose and need for the plan / draft EIS
- the special characteristics of Indiana Dunes National Lakeshore
- a description of the ecological issues along the Indiana Dunes National Lakeshore shoreline
- a description of the process of shoreline restoration and management planning
- an update on the planning process

The public comment period for the proposed project was from December 8, 2010, through February 7, 2011. A total of 24 public comments were submitted during the comment period either in comment form, letter, electronic mail, or website format (http://parkplanning.nps.gov/indu).

After summarizing the discussions at the public meetings and reviewing the comments submitted the NPS project team developed a list of issues of concern presented by the public. Recreational use of the park was important to many commenters. The ecological issues receiving the most comment included general habitat, water quality, threatened and endangered species and species of concern, and the impacts of visitors on the environment. Most commenters indicated valuing the preservation and restoration of the shoreline not only for recreational uses but also for the ecological and biological diversity of the area.

Newsletter #2, Issued during Summer 2011

Newsletter #2 was issued in May 2011 and recapped the information presented at the public scoping meetings held in December 2010. This newsletter summarized the comments received during the previous public scoping efforts, and also:

- described shoreline sediment movement and shoreline restoration tools
- updated readers on the planning process and the planning considerations that had been identified to date
- invited readers to participate in the planning efforts

Using input received from the public and considering the probable environmental consequences and costs of the alternatives, the NPS project team developed a list of alternatives, including a preliminary preferred alternative, and analyzed the affected environment and impacts associated with each. The results of this analysis were published in the plan / draft EIS, which was distributed for public review. The mailing list for the plan / draft EIS included over 300 individuals and groups.

COOPERATING AGENCIES

In accordance with NEPA (42 *United States Code* [USC] 4321-4370h) and the CEQ regulations (sections 1501.5 and 1501.6),the National Park Service invited the U.S. Army Corps of Engineers (COE), Chicago District, and the State of Indiana to be cooperating agencies for the EIS process. Both agencies were requested to provide information in their areas of technical expertise and to review and comment on the plan / draft EIS. The State of Indiana declined to participate as a cooperating agency.

The COE replied to the park's invitation and indicated they would participate as a cooperating agency with the National Park Service in the development of the plan / draft EIS. A memorandum of understanding between the National Park Service and the COE was executed on August 17, 2010. This agreement defined the roles and responsibilities of each agency relative to the plan / draft EIS.

CONSULTATION AND COORDINATION TO DATE WITH OTHER AGENCIES, OFFICES, AND TRIBES

Appendix B: Initial Agency Consultation contains a copy of correspondence related to this plan / draft EIS.

FEDERAL AGENCIES

U.S. Fish and Wildlife Service, Section 7 Consultation

The Endangered Species Act of 1973, as amended, requires in section 7(a)(2) that each federal agency, in consultation with the Secretary of the Interior, ensure that any action the agency authorizes, funds, or carries out will not jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

The National Park Service contacted the U.S. Fish and Wildlife Service (FWS) in a letter dated July 2011. The letter advised the U.S. Fish and Wildlife Service of the NPS planning process for this plan / draft EIS and requested concurrence with a determination that the proposed project may affect, but is not likely to adversely affect endangered, threatened, and candidate species nor adversely modify piping plover critical habitat.

The U.S. Fish and Wildlife Service responded to the park's request in a letter dated August 8, 2011, and concurred with the NPS determination for special status species and critical habitat found within the proposed project area (which encompasses the shoreline of Lake Michigan between Michigan City in LaPorte County on the east, and the U.S. Steel breakwater in Gary in Lake County on the west). The entire Porter County shoreline of Lake Michigan is also included in the project area.

STATE AGENCIES

Section 106 Consultation

Agencies that have direct or indirect oversight of historic properties are required under Section 106 of the National Historic Preservation Act, as amended (NHPA) (16 USC 470, *et seq.*), to take into account the effect of any undertaking on properties listed in or eligible for listing in the National Register of Historic Places.

In a letter dated April 28, 2011, the National Park Service contacted the Indiana state historic preservation officer (SHPO). The letter advised the Indiana SHPO about the start of the NPS planning process for this plan / draft EIS and requested SHPO's involvement in the planning process, soliciting input on the issues and concerns to be addressed in the plan / draft EIS. A letter dated May 23, 2011, from James A. Glass, Deputy SHPO, stated that the Indiana SHPO had no specific comments at that time, but looked forward to receiving additional information about the project as it became available. The Indiana SHPO will have an opportunity to review and comment on this plan / draft EIS. This document provides the basis for NPS' determination of "no adverse effect" on historic properties. Assuming the state of Indiana concurs with the NPS' determination of "no adverse effect," it will transmit its formal concurrence in writing and that letter will be published in the plan / final EIS.

Coastal Zone Consistency Determination

Federal agency activities in or affecting Indiana's coastal zone must comply with Section 307 of the Coastal Zone Management Act (CZMA) and implementing regulations,

which require that such federal activities be conducted in a manner consistent, to the extent practicable, with Indiana's Coastal Management Program. The park is included in Indiana's coastal zone. The National Park Service has determined that the preferred alternative is consistent with Indiana's coastal management program, including the state's goals and policies for this area.

This plan / draft EIS provides the substantive basis for NPS' consistency determination. The National Park Service has submitted this document to the Indiana Department of Natural Resources (IDNR) for its concurrence.

Such a consistency determination and the agency's concurrence comply with the requirements of the CZMA. Assuming the state of Indiana concurs with the NPS' consistency determination it will transmit its formal concurrence in writing and that letter will be published in the plan / final EIS.

AMERICAN INDIAN TRIBES

The National Park Service recognizes that indigenous peoples may have traditional interests and rights in lands now under NPS management. Native American concerns about park projects are sought through Native American consultation. The need for government-to-government Native American consultations stems from the historic power of Congress to make treaties with American Indian tribes as sovereign nations. Consultation with American Indians and other Native Americans, such as Native Hawaiians and Alaska Natives, is required by various federal laws, executive orders, regulations, and policies. They are needed, for example, to comply with Section 106 of the NHPA. Implementing regulations of the CEQ also call for Native American consultation.

The National Park Service contacted eight federally recognized tribes and one tribe not federally recognized through letters dated February 24, 2011. The NPS letter provided the tribes a brief background and description of the project area and invited the tribes to participate in the development of the plan / draft EIS. To date, no tribes have responded. The tribes contacted are listed below.

- Citizen Potawatomi Nation
- Forest County Potawatomi
- Hannahville Indian Community of Wisconsin Potawatomi Indians of Michigan
- Match-e-be-nash-she-wish Band of Potawatomi Indians
- Miami Tribe of Oklahoma
- Nottawaseppi Huron Band of Potawatomi Indians
- Pokagon Band of Potawatomi Indians
- Prairie Band of Potawatomi Nation
- Miami Nation of Indians of the State of Indiana (not federally recognized)

LIST OF RECIPIENTS OF PLAN / SHORELINE RESTORATION AND MANAGEMENT PLAN / FINAL ENVIRONMENTAL IMPACT STATEMENT

The National Park Service made the plan / final EIS available to the agencies and organizations listed below in either electronic format or hard copy. Copies of the document are available for review at Indiana Dunes National Lakeshore and at http://parkplanning.nps.gov/indu. A limited number of hardcopies of the document are also available upon request by interested individuals.

FEDERAL DEPARTMENTS AND AGENCIES

COE, Chicago District
U.S. Fish and Wildlife Service
U.S. House of Representatives
Office of Senator Richard Lugar
U.S. Environmental Protection Agency, Great Lakes National Program Office
U.S. Geological Survey Lake Michigan Ecological Research Station

STATE AGENCIES

Indiana Department of Environmental Management
Indiana Department of Natural Resources
Indiana Geological Survey
Indiana Dunes State Park
Lake Michigan Coastal Program
State of Indiana (Governor)

COUNTY AND LOCAL AGENCIES

Beverly Shores Town Council
Burns Harbor Town Council
Chesterton Town Council
City of Chicago (Mayor)
City of Gary (Mayor)
City of Gary (Department of Environmental Affairs)
City of Gary (Park Department)
City of Lake Station (Mayor)
City of Michigan City (Mayor)
City of Portage (Mayor)
Dune Acres Town Council
Lake County Commission
Lake County Council
53 Lake County Parks and Recreation Department
LaPorte County Board of Commissioners
LaPorte County Council
LaPorte County Parks and Recreation
Michigan City Parks and Recreation Department
Michigan City Port Authority
Northwest Indiana Forum
Northwest Indiana Regional Development Authority
Northwest Indiana Regional Planning Commission
Ogden Dunes Town Council
Pines Town Council
Port of Indiana, Burns International Harbor
Porter County Board of Commissioners
Porter County Commission
Porter County Council
Ports of Indiana
Town of Beverly Shores
Town of Chesterton
Town of Ogden Dunes

ORGANIZATIONS AND BUSINESSES

Association of Beverly Shores Residents
Arcelor Mittal
Chicago Wilderness
Coastal and Hydraulics Lab
Eppley Institute for Parks and Public Lands
Friends of the Indiana Dunes
Indiana-American Water Company, Inc.
Dunes Learning Center
Indiana Landmarks
Indiana University
Izaak Walton League
Little Calumet River Basin Development Commission

National Parks and Conservation Association
NiSource Corporate Services Company
Purdue University Calumet
Save the Dunes Conservation Fund
Save the Dunes Council
Shirley Heinze Land Trust
The Nature Conservancy
The Trust for Public Land
U.S. Steel, Midwest Division
U.S. Steel, Gary Works
Gary Chamber of Commerce
Greater Portage Chamber of Commerce
Greater Valparaiso Chamber of Commerce
Indiana Dunes Tourism
Porter County Convention and Visitor Commission
South Shore Convention and Visitors Authority
Lakeshore Chamber of Commerce
Chesterton Duneland Chamber of Commerce
LaPorte County Convention and Visitors Bureau
Michigan City Area Chamber of Commerce

AMERICAN INDIAN TRIBES AND AGENCIES

Citizen Potawatomi Nation
Forest County Potawatomi
Hannahville Indian Community of Wisconsin Potawatomi Indians of Michigan
Match-e-be-nash-she-wish Band of Potawatomi Indians
Miami Tribe of Oklahoma
Nottawaseppi Huron Band of Potawatomi Indians
Pokagon Band of Potawatomi Indians
Prairie Band of Potawatomi Nation
Miami Nation of Indians of the State of Indiana (not Federally recognized)

PUBLIC REVIEW OF PLAN / DRAFT EIS

Availability of the plan / draft EIS was announced through local newspapers, postings on the park website, and on the Planning Environment and Public Comment (PEPC) website, and announcements in the Federal Register.

During the 60-day comment period hardcopies of the plan / draft EIS were available for review at the headquarters of the Indiana Dunes National Lakeshore located at 1100 North Mineral Springs Road, Porter, Indiana, 46304; at the Park's Visitor Center located at 1215 North State Road 49, Porter, Indiana 46304; at the Beverly Shores Town Hall; the Michigan City Public Library; and on the internet as indicated below. Copies of the plan / draft EIS were also sent to applicable federal, state, and local agencies for review and comment.

An electronic copy of the document could be found on the NPS PEPC website at http://parkplanning.nps.gov. This site provides access to current plans, environmental analyses, and related documents available for public review. The document was posted on PEPC under the Midwest Region, Indiana Dunes National Lakeshore. The plan / draft EIS could also be accessed through the park's home page at: http://www.nps.gov/indu. The public was encouraged to submit comments on the plan / draft EIS during the 60-day comment period.

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Selected Bibliography, Index, Glossary, and Appendixes

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GLOSSARY

A–weighted decibels(dBA) – An expression of the relative loudness of sounds in air as perceived by the human ear.

accretion – The process of growth or enlargement by a gradual buildup of sediment.

accretion area – A portion of the shoreline at which coastal sediments return to the visible portion of the beach, gradually increasing its size.

adaptive management – A systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form, "active" adaptive management employs management programs that are designed to experimentally compare selected policies or practices, by implementing management actions explicitly designed to generate information useful for evaluating alternative hypotheses about the system being managed.

aeolian transport – Movement and weathering of sand particles behind and parallel to the shoreline caused by wind. It is the first process of coastal dune formation.

anadromous – Migratory fishes which spend most of their lives in the sea and migrate upstream to fresh water to breed.

anoxia – A total decrease in oxygen levels.

anthropogenic effects – Effects which are caused by or attributed to humans. As used within this document, they are factors that cause stress in natural systems.

attributes – Any living or nonliving feature or process of the environment that can be measured or estimated and that provide insights into the state of the ecosystem. The term indicator is reserved for a subset of attributes that is particularly information–rich in the sense that their values are somehow indicative of the quality, health, or integrity of the larger ecological system to which they belong.

benthic – Living at, in, or associated with structures on the bottom of a body of water.

berm – A mound of earth or sand formed into a narrow shelf, path, or ledge which is typically located at the top or bottom of a slope.

biomass – Represents the entire community of living biological organisms in a given area or ecosystem at a certain point in time.

biome – A complex biotic community extending over a large geographic area and characterized by distinctive plant and animal species and the prevailing climate.

blowout – A sandy depression in a sand dune ecosystem caused by the removal of sediment by wind. This usually occurs when a patch of protective vegetation is lost.

boreal relic – A group of plants with characteristics similar to those found in northern Boreal forests that are remnants of historical ecological conditions and are unlike the current surrounding vegetation.

calcareous – Mostly or partly composed of calcium carbonate, or containing lime and being chalky.

clay sill – A tabular igneous intrusion that parallels the bedding of the surrounding sedimentary or metamorphic rock.

chart datum –The lowest astronomically predictable tide level, this level is used as a reference level on nautical charts; the maps of the lake and lakebed.

demersal – Living near, deposited on, or sinking to the bottom of a body of water.

dreissenid – A small, aquatic bivalve mollusk which attaches to stones or any other hard surface in freshwater.

dune succession – The process of a dune changing from inorganic and unpopulated, to a dune that has organic components and is highly populated. It is the evolution of a dune beginning with its development as a foredune close to the beach with little established vegetation, to the final stage as a wooded dune farther back from the beach.

dynamically stable – A dynamic equilibrium where the shoreline shape is relatively constant over a period of months or years. Although the shoreline shape is constant, in response to varying winds, waves and currents, the position of the shoreline at any particular time will vary about the average.

ecological restoration – Highlights the recovery of pre–disturbance biotic communities and native species composition. It attempts to return an ecosystem or natural community to historic, pre–disturbance conditions. In its broadest sense, ecological restoration is the process of assisting the recovery of a degraded, damaged, or severely altered ecosystem. Example: Remove invasive species from an otherwise intact habitat, such as a panne.

ecological preservation – The act or process of applying the measures necessary to sustain the existing form, function, and integrity of an ecosystem or natural area. Preservation focuses on protection and avoids degradation altogether. Example: Early Detection and Rapid Response.

ecological indicator – Measurable attributes of the environment that provide insights regarding (1) the functional status of one or more key ecosystem processes, (2) the status of ecosystem properties that are clearly related to these ecosystem processes, and/or (3) the capacity of ecosystem processes or properties to resist or recover from natural disturbances and/or anthropogenic stressors. In the context of ecosystem health, key ecosystem processes and properties are those that are most closely associated with the capacity of the ecosystem to maintain its characteristic structural and functional attributes over time (including natural variability).

embayment – A bay or a formation resembling a bay or the formation of a bay.

embryonic dunes – Dry beach features resembling miniature dunes, formed by wind–deposited sand on and leeward of objects that decrease wind velocity, such as driftwood and vegetation.

endemic – Flora, fauna, or other distinctive characteristics that are exclusively found in a defined geographic location.

entrainment – The process by which sediment from the surface is incorporated into a fluid flow, such as air or water, as part of the process of erosion.

eroded parabolic dune – A U–shaped dune with elongated arms formed as a result of a blowout area.

fen – A type of wetland characterized by neutral or alkaline water chemistry with high dissolved mineral levels but few other plant nutrients and fed by mineral–rich surface water or groundwater.

fillet beach – A beach formed by accretion processes, or retained by a coastal protection structure.

foraging – The act of searching for and exploiting food resources.

foredune – Low, very active dunes that run parallel to the shoreline of a large lake or ocean and are stabilized by vegetation. They are often the smallest and youngest dunes along a coast and are located just shorewards of embryonic dunes.

hardened structures – Navigational and industrial structures as well as other materials installed to armor the shoreline, including revetment walls and sheet piling.

high floristic quality – A quantitative indicator of good ecosystem health based on the Floristic Quality Assessment. Individual, native species are ranked with a Coefficient of Conservatism based on their likelihood to occur in a landscape relatively unaltered from those of pre–settlement times. A higher ranking indicates a lower likelihood of that species appearing in a given setting due to its high ecological requirements, so if many species of high floristic quality are present, the ecosystem is more likely to be healthy and meet those ecological requirements.

homogenous – Having the same composition throughout; of uniform make up.

infaunal – Aquatic animals that live in the substrate of a body of water, especially in a soft sea bottom.

interstitial space – An empty space or gap between spaces full of structure or matter.

lacustrine – Of or relating to lakes.

lake substrate – The earthy material that exists at the bottom of a lake, such as dirt, rocks, sand, or gravel.

lakebed down–cutting – The gradual erosion of cohesive soil, such as clay or glacial till, from a shoreline due to wave interaction.

lee side – The side of something that is sheltered from the wind.

leeward – On or toward the side sheltered from the wind; downwind.

littoral – Of or pertaining to the shore of a large body of water.

longshore transport – The sediment movement with a direction parallel to the shoreline; alongshore.

low water datum –The base elevation for Lake Michigan, used as a reference level for measurement of water depth.

macroinvertebrate – An invertebrate that is large enough to be seen without a microscope.

maintenance dredging – The routine removal of accumulated sediment from the bottom of a waterway to ensure continued ease of navigation or the holding capacity of reservoirs or lakes.

marl – Lake sediments which have been hardened over time to create a calcium carbonate or lime–rich mud or mudstone which contains variable amounts of clays and aragonite, or crystalized calcium carbonate.

meiofauna – Small, aquatic invertebrates that live on or within the substrate on the bottom of a large body of water.

mesic – A type of habitat with a moderate or well–balanced supply of moisture.

mesophytic – Grown in or adapted to a moderately moist environment.

mitigation measures – Steps taken to moderate, or reduce the severity of, a quality or condition in force or intensity.

net transport rate – The net amount of sediment movement in the predominant direction; expressed in cubic yards per year.

oligotrophic – A lake with low primary biological productivity as a result of low nutrient content. These lakes have very clear water, high drinking–water quality, ample oxygen, and support a wide variety of fish species due relatively low levels of algae.

open–water placement – Placing of dredged sediment in an open–water section of the lake, away from the dredging location. This sediment must be clean and meet set federal guidelines to qualify for open–water placement.

overflight – An air flight over a specific area, country or territory.

pannes – A series of shallow ponds located among sand dunes.

pelagic – Occurring in or over open water and away from the bottom.

phytoplankton – Photosynthesizing microscopic organisms which inhabit the upper sunlit layer of most water bodies. If they are present in a large quantity, they can make the water body appear green.

piscivorous – Fish–eating.

pseudofeces – Wastes released by filter–feeding bivalve mollusks that are comprised of suspended particles which have been rejected as unsuitable for food.

recolonization – The reestablishment of flora and fauna in an ecologically disturbed area. Vegetative recolonization begins with hardy species such as grasses and progresses with more sensitive species as the area recovers environmentally.

refugia – Any local environments that have escaped regional ecological change and therefore provide habitats for threatened or endangered species.

revetment – Sloping structures placed on banks or cliffs in such a way as to absorb the energy of incoming water

sandscape – A landscape dominated by sand.

sediment budget – A costal management tool used to balance the sediment volumes entering or exiting a particular section of coast. This can be used to predict changes to the form and structure of a coastline over time.

sediment deficit – A net loss of sediment from a coastline, based on the sediment budget. This can be remedied by physically adding sediment to a coastline to combat widespread erosion.

seedbank – A stockpile of seeds which acts as a source for planting in case seed reserves elsewhere are destroyed.

sheet piling – A cylindrical or flat member of wood, steel, concrete, etc., often tapered or pointed at the lower end, hammered vertically into soil to form part of a foundation or retaining wall. They are driven side by side to retain earth, etc., or to prevent seepage into an excavation.

social trails – A path developed by erosion caused by footfall. The path usually represents the shortest or most easily navigated route between an origin and destination. The width and amount of erosion of the line represents the amount of demand.

soundscapes – An atmosphere or environment created by or with sound.

spawning – To deposit eggs or sperm directly into the water, as fishes.

swash zone – A turbulent layer of water that washes up on the beach after an incoming wave has broken. The swash action can move beach material up and down on the beach, which results in the cross–shore sediment exchange.

taxa – Taxonomic categories, as a species or genus.

tectonic activity – Movement associated with the earth's structural features.

terrestrial fauna – The aggregate of animals that inhabit dry land.

thermoregulatory – Tending to maintain a body at a particular temperature whatever its environmental temperature.

trophic level – The position an organism occupies on the food chain.

viewshed – An area of land, water, or other environmental element that is visible to the human eye from a fixed vantage point.

zooplankton – Heterotrophic (sometimes detritivorous) plankton. Plankton are organisms drifting in oceans, seas, and bodies of fresh water.

APPENDIX A: ENABLING LEGISLATION

PUBLIC LAW 89-761

PUBLIC LAW 94-549

PUBLIC LAW 96-612

PUBLIC LAW 99-583

PUBLIC LAW 102-430

COMPILATION OF LEGISLATION

Public Law 89-761

AN ACT

November 5, 1966
[S. 360]

To provide for the establishment of the Indiana Dunes National Lakeshore, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to preserve for the educational, inspirational, and recreational use of the public certain portions of the Indiana dunes and other areas of scenic, scientific, and historic interest and recreational value in the State of Indiana, the Secretary of the Interior is authorized to establish and administer the Indiana Dunes National Lakeshore (hereinafter referred to as the "lakeshore") in accordance with the provisions of this Act. The lakeshore shall comprise the area within the boundaries delineated on a map identified as "A Proposed Indiana Dunes National Lakeshore", dated September 1966, and bearing the number "LNPNE–1008–ID", which map is on file and available for public inspection in the office of the Director of the National Park Service, Department of the Interior.

Indiana Dunes National Seashore.
Establishment.

SEC. 2. (a) Within the boundaries of the lakeshore the Secretary of the Interior (hereinafter referred to as the "Secretary") is authorized to acquire lands, waters, and other property, or any interest therein, by donation, purchase with donated or appropriated funds, exchange, or otherwise. The Indiana Dunes State Park may be acquired only by donation of the State of Indiana, and the Secretary is hereby directed to negotiate with the State for the acquisition of said park. In exercising his authority to acquire property by exchange for the purposes of this Act, the Secretary may accept title to non-Federal property located within the area described in section 1 of this Act and convey to the grantor of such property any federally owned property under the jurisdiction of the Secretary which he classifies as suitable for exchange or other disposal within the State of Indiana or Illinois. Properties so exchanged shall be approximately equal in fair market value, as determined by the Secretary who may, in his discretion, base his determination on an independent appraisal obtained by him: *Provided*, That the Secretary may accept cash from or pay cash to the grantor in such an exchange in order to equalize the values of the properties exchanged.

Acquisition of lands, authorization.

(b) In exercising his authority to acquire property under subsection (a) of this section, the Secretary may enter into contracts requiring the expenditure, when appropriated, of funds authorized to be appropriated by section 10 of this Act, but the liability of the United States under any such contract shall be contingent on the appropriation of funds sufficient to fulfill the obligations thereby incurred.

Contracts.

SEC. 3. As soon as practicable after the effective date of this Act and following the acquisition by the Secretary of an acreage within the boundaries of the area described in section 1 of this Act which in his opinion is efficiently administrable for the purposes of this Act, he shall establish the Indiana Dunes National Lakeshore by publication of notice thereof in the Federal Register. Following such establishment and subject to the limitations and conditions prescribed in section 1 hereof, the Secretary may continue to acquire lands and interests in lands for the lakeshore.

Boundaries.
Publication in Federal Register.

SEC. 4. (a) The Secretary's authority to acquire property by condemnation shall be suspended with respect to all improved property located within the boundaries of the lakeshore during all times when an appropriate zoning agency shall have in force and applicable to such property a duly adopted, valid zoning ordinance approved by the Secretary in accordance with the provisions of section 5 of this Act.

Condemned property.

"Improved property."

(b) The term "improved property", whenever used in this Act, shall mean a detached, one-family dwelling, construction of which was begun before January 4, 1965, together with so much of the land on which the dwelling is situated, the said land being in the same ownership as the dwelling, as the Secretary shall designate to be reasonably necessary for the enjoyment of the dwelling for the sole purpose of noncommercial residential use, together with any structures accessory to the dwelling which are situated on the lands so designated. The amount of land so designated shall in every case be not more than three acres in area, and in making such designation the Secretary shall take into account the manner of noncommercial residential use in which the dwelling and land have customarily been enjoyed: *Provided*, That the Secretary may exclude from the land so designated any beach or waters, together with so much of the land adjoining such beach or waters, as he may deem necessary for public access thereto or public use thereof.

Standards.

SEC. 5. (a) As soon as practicable after enactment of this Act, the Secretary shall issue regulations specifying standards for approval by him of zoning ordinances for the purposes of sections 4 and 6 of this Act. The Secretary may issue amended regulations specifying standards for approval by him of zoning ordinances whenever he shall consider such amended regulations to be desirable due to changed or unforeseen conditions. The Secretary shall approve any zoning ordinance and any amendment to any approved zoning ordinance submitted to him which conforms to the standards contained in the regulations in effect at the time of adoption of such ordinance or amendment by the zoning agency. Such approval shall not be withdrawn or revoked, by issuance of any amended regulations after the date of such approval, for so long as such ordinance or amendment remains in effect as approved.

(b) The standards specified in such regulations and amended regulations for approval of any zoning ordinance or zoning ordinance amendment shall contribute to the effect of (1) prohibiting the commercial and industrial use, other than any commercial or industrial use which is permitted by the Secretary, of all property covered by the ordinance within the boundaries of the lakeshore; and (2) promoting the preservation and development, in accordance with the purposes of this Act, of the area covered by the ordinance within the lakeshore by means of acreage, frontage, and setback requirements and other provisions which may be required by such regulations to be included in a zoning ordinance consistent with the laws of the State of Indiana.

(c) No zoning ordinance or amendment thereof shall be approved by the Secretary which (1) contains any provision which he may consider adverse to the preservation and development, in accordance with the purposes of this Act, of the area comprising the lakeshore; or (2) fails to have the effect of providing that the Secretary shall receive notice of any variance granted under and any exception made to the application of such ordinance or amendment.

(d) If any improved property, with respect to which the Secretary's authority to acquire by condemnation has been suspended according to the provisions of this Act, is made the subject of a variance under or exception to such zoning ordinance, or is subjected to any use, which variance, exception, or use fails to conform to or is inconsistent with any applicable standard contained in regulations issued pursuant to this section and in effect at the time of passage of such ordinance, the Secretary may, in his discretion, terminate the suspension of his authority to acquire such improved property by condemnation.

(e) The Secretary shall furnish to any party in interest requesting the same a certificate indicating, with respect to any property located within the lakeshore as to which the Secretary's authority to acquire such property by condemnation has been suspended in accordance with provisions of this Act, that such authority has been so suspended and the reasons therefor.

Owners of improved property, retention rights.

SEC. 6. (a) Any owner or owners of improved property on the date of its acquisition by the Secretary may, as a condition to such acquisition, retain the right of use and occupancy of the improved property for noncommercial residential purposes for a term of twenty-five years, or for such lesser time as the said owner or owners may elect at the time of acquisition by the Secretary. Where any such owner retains a right of use and occupancy as herein provided, such right during its existence may be conveyed or leased for noncommercial residential purposes. The Secretary shall pay to the owner the fair market value of the property on the date of such acquisition, less the fair market value on such date of the right retained by the owner.

Termination right of Secretary.

(b) The Secretary shall have authority to terminate any right of use and occupancy retained as provided in subsection (a) of this section at any time after the date upon which any use occurs with respect to such property which fails to conform or is in any manner opposed to or inconsistent with the applicable standards contained in regulations issued pursuant to section 5 of this Act and which is in effect on said date: *Provided*, That no use which is in conformity with the provisions of a zoning ordinance approved in accordance with said section 5 and applicable to such property shall be held to fail to conform or be opposed to or inconsistent with any such standard. In the event the Secretary terminates a right of use and occupancy under this subsection, he shall pay to the owner of the right so terminated an amount equal to the fair market value of the portion of said right which remained unexpired on the date of termination.

Administration.

SEC. 7. (a) In the administration of the lakeshore the Secretary may utilize such statutory authorities relating to areas of the national park system and such statutory authority otherwise available to him for the conservation and management of natural resources as he deems appropriate to carry out the purposes of this Act.

(b) In order that the lakeshore shall be permanently preserved in its present state, no development or plan for the convenience of visitors shall be undertaken therein which would be incompatible with the preservation of the unique flora and fauna or the physiographic conditions now prevailing or with the preservation of such historic sites and structures as the Secretary may designate: *Provided*, That the Secretary may provide for the public enjoyment and understanding of the unique natural, historic, and scientific features within the lakeshore by establishing such trails, observation points, and exhibits and providing such services as he may deem desirable for such public enjoyment and understanding: *Provided further*, That the Secretary may develop for appropriate public uses such portions of the lakeshore as he deems especially adaptable for such uses.

Indiana Dunes National Lakeshore Advisory Commission.

SEC. 8. (a) There is hereby established an Indiana Dunes National Lakeshore Advisory Commission. Said Commission shall terminate ten years after the date of establishment of the national lakeshore pursuant to this Act.

Membership.

(b) The Commission shall be composed of seven members, each appointed for a term of two years by the Secretary, as follows: (1) one member who is a year-round resident of Porter County to be appointed from recommendations made by the commissioners of such county; (2) one member who is a year-round resident of the town of Beverly Shores to be appointed from the recommendations made by

the board of trustees of such town; (3) one member who is a year-round resident of the towns of Porter, Dune Acres, Portage, Pines, Chesterton, Ogden Dunes, or the village of Tremont, such member to be appointed from recommendations made by the boards of trustees or the trustee of the affected town or township; (4) one member who is a year-round resident of the city of Michigan City to be appointed from recommendations made by such city; (5) two members to be appointed from recommendations made by the Governor of the State of Indiana; and (6) one member to be designated by the Secretary.

(c) The Secretary shall designate one member to be Chairman. Any vacancy in the Commission shall be filled in the same manner in which the original appointment was made.

(d) A member of the Commission shall serve without compensation as such. The Secretary is authorized to pay the expense reasonably incurred by the Commission in carrying out its responsibilities under this Act on vouchers signed by the Chairman.

(e) The Secretary or his designee shall, from time to time, consult with the Commission with respect to matters relating to the development of the Indiana Dunes National Lakeshore and with respect to the provisions of sections 4, 5, and 6 of this Act.

Crimes and offenses, jurisdiction.

SEC. 9. Nothing in this Act shall deprive the State of Indiana or any political subdivision thereof of its civil and criminal jurisdiction over persons found, acts performed, and offenses committed within the boundaries of the Indiana Dunes National Lakeshore or of its right to tax persons, corporations, franchises, or other non-Federal property on lands included therein.

Appropriation.

SEC. 10. There are hereby authorized to be appropriated not more than $27,900,000 for the acquisition of land and interests in land pursuant to this Act.

Approved November 5, 1966.

Public Law 89-762

November 5, 1966
[S. 1496]

AN ACT

To repeal section 3342 of title 5, United States Code, relating to the prohibition of employee details from the field service to the departmental service, and for other purposes.

Federal employee details.
Ante, p. 425.
Repeal.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) section 3342 of title 5, United States Code, relating to the prohibition of details of employees from the field service to the departmental service, is hereby repealed.

(b) The table of contents of subchapter III of chapter 33 of title 5, United States Code, is amended by striking out—

"3342. Details; field to departmental service prohibited."

SEC. 2. Section 525 of the Act of June 17, 1930 (46 Stat. 741; 19 U.S.C. 1525), which provides exception to the Department of the Treasury from the restrictions imposed by section 3342 of title 5, United States Code, is hereby repealed.

Approved November 5, 1966.

Public Law 94–549
94th Congress

An Act

To amend the Act establishing the Indiana Dunes National Lakeshore to provide for the expansion of the lakeshore, and for other purposes.

Oct. 18, 1976
[H.R. 11455]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act entitled "An Act to provide for the establishment of the Indiana Dunes National Lakeshore, and for other purposes", approved November 5, 1966 (80 Stat. 1309), as amended (16 U.S.C. 460u), is further amended as follows:

Indiana Dunes National Lakeshore. Expansion.

(1) The last sentence of the first section of such Act is amended by striking out "'A Proposed Indiana Dunes National Lakeshore', dated September 1966, and bearing the number 'LNPNE–1008–ID'" and inserting in lieu thereof "'Boundary Map, Indiana Dunes National Lakeshore', dated September 1976 and bearing the number '626–91007'".

(2) Section 3 of such Act is amended by inserting the following at the end of the first sentence: "By no later than October 1, 1977, the Secretary shall publish in the Federal Register a detailed description of the boundaries of the lakeshore and shall from time to time so publish any additional boundary changes as may occur.".

16 USC 460u–2.
Publication in Federal Register.

(3)(a) Subsection 4(a) of such Act is repealed, subsection 4(b) is redesignated as section 4, and the following sentence is added to new section 4: "All rights of use and occupancy shall be subject to such terms and conditions as the Secretary deems appropriate to assure the use of such property in accordance with the purposes of this Act.".

Repeal.
16 USC 460u–3.

(b) The first sentence of section 4 of such Act is amended by inserting immediately after "was begun before" the following: "February 1, 1973, or, in the case of improved property located within the boundaries delineated on a map identified as 'A Proposed Indiana Dunes National Lakeshore', dated September 1966, and bearing the number 'LNPNE–1008–ID', which map is on file and available for public inspection in the Office of the Director of the National Park Service, Department of the Interior, before".

(4)(a) Section 6(a) of such Act is amended by revising the first sentence thereof to read as follows: "Except for owners of property within the area on the map referred to in the first section of this Act as area II–B, any owner or owners, having attained the age of majority, of improved property on the date of its acquisition by the Secretary may, as a condition to such acquisition, retain the rights of use and occupancy of the improved property for noncommercial residential purposes for a term of twenty years, or for such lesser term as the owner or owners may elect at the time of acquisition by the Secretary".

16 USC 460u–5.
Right of use and occupancy.

(b) Section 6(b) of such Act is amended to read as follows:

"(b) Upon his determination that the property, or any portion thereof, has ceased to be used in accordance with the applicable terms and conditions, the Secretary may terminate a right of use and occupancy. Nonpayment of property taxes, validly assessed, on any retained right of use and occupancy shall also be grounds for termination of such right by the Secretary. In the event the Secretary terminates a right of use and occupancy under this subsection he shall

Termination.

pay to the owners of the retained right so terminated an amount equal to the fair market value of the portion of said right which remained unexpired on the date of termination. With respect to any right of use and occupancy in existence on the effective date of this sentence, standards for retention of such rights in effect at the time such rights were reserved shall constitute the terms and conditions referred to in section 4.".

16 USC 460u-3.
Indiana Dunes National Lakeshore Advisory Commission, membership.
16 USC 460u-7.

(5) Section 8(b) of such Act is amended (a) by striking out "seven members" and inserting in lieu thereof "eleven members", and (b) by striking out "and" immediately after "State of Indiana;", and (c) by striking out "Portage," immediately after "Dune Acres.", and (d) by inserting immediately after "designated by the Secretary" the following: "; (7) one member who is a year-round resident of the city of Gary to be appointed from recommendations made by the mayor of such city; (8) one member to be appointed from recommendations made by a regional planning agency established under the authority of the laws of the State of Indiana and composed of representatives of local and county governments in northwestern Indiana; (9) one member who is a year-round resident of the city of Portage to be appointed from recommendations made by the mayor of such city; and (10) one member who holds a reservation of use and occupancy and is a year-round resident within the lakeshore to be designated by the Secretary.".

(6) Section 8 of such Act is further amended by inserting the following new subsection (f):

Coal-fired powerplant, Porter County, Ind.

"(f) The Advisory Commission is authorized to assist with the identification of economically and environmentally acceptable areas, outside of the boundaries of the lakeshore, for the handling and disposal of industrial solid wastes produced by the coal-fired powerplant in Porter County, Indiana, section 21, township 37 north, range 6 west.".

Appropriation authorization.
16 USC 460u-9.

(7) Section 10 of such Act is amended to read as follows: "The Secretary may not expend more than $60,812,100 from the Land and Water Conservation Fund for the acquisition of lands and interests in lands nor more than $8,500,000 for development. By October 1, 1979, the Secretary shall develop and transmit to the Committees on Interior and Insular Affairs of the United States Congress a general management plan detailing the development of the national lakeshore consistent with the preservation objectives of this Act, indicating:

General management plan, submittal to congressional committees.

"(1) the facilities needed to accommodate the health, safety, and recreation needs of the visiting public;

"(2) the location and estimated costs of all facilities, together with a review of the consistency of the master plan with State, areawide, and local governmental development plans;

"(3) the projected need for any additional facilities within the national lakeshore; and

"(4) specific opportunities for citizen participation in the planning and development of proposed facilities and in the implementation of the general management plan generally.".

(8) Such Act is amended by adding at the end thereof the following:

Rights-of-way or easements.
16 USC 460u-10.

"SEC. 11. Nothing in this Act shall diminish any existing (as of March 1, 1975) rights-of-way or easements which are necessary for high voltage electrical transmission, pipelines, water mains, or line-haul railroad operations and maintenance.

"SEC. 12. (a) Nothing in the Act shall be construed as prohibiting any otherwise legal cooling, process, or surface drainage into the part of the Little Calumet River located within the lakeshore: *Provided*, That this subsection shall not affect nor in any way limit the Secretary's authority and responsibility to protect park resources. Little Calumet River. 16 USC 460u-11.

"(b) The authorization of lands to be added to the lakeshore by the Ninety-fourth Congress and the administration of such lands as part of the lakeshore shall in and of itself in no way operate to render more restrictive the application of Federal, State, or local air and water pollution standards to the uses of property outside the boundaries of the lakeshore, nor shall it be construed to augment the control of water and air pollution sources in the State of Indiana beyond that required pursuant to applicable Federal, State, or local law.

"SEC. 13. The Secretary shall acquire the area on the map referred to in the first section of this Act as area III-B within two years from the effective date of this section only if such area can be acquired for not more than $800,000, exclusive of administrative costs of acquisition, as adjusted by the Consumer Price Index: *Provided*, That the Secretary may not acquire such area by any means after two years from the effective date of this section. Land acquisition. 16 USC 460u-12.

"SEC. 14. The Secretary may acquire that portion of area I-C which is shaded on the map referred to in the first section of this Act only with the consent of the owner unless the present owner attempts to sell or otherwise dispose of such area. 16 USC 460u-13.

"SEC. 15. Within one year after the date of the enactment of this section, the Secretary shall submit, in writing, to the Committees on Interior and Insular Affairs and to the Committees on Appropriations of the United States Congress a detailed plan which shall indicate— Plan, submittal to congressional committees. 16 USC 460u-14.

"(1) the lands which he has previously acquired by purchase, donation, exchange, or transfer for administration for the purpose of the lakeshore; and

"(2) the annual acquisition program (including the level of funding) which he recommends for the ensuing five fiscal years.

"SEC. 16. The Secretary may acquire only such interest in the right-of-way designated 'Crossing A' on map numbered 626-91007 as he determines to be necessary to assure public access to the banks of the Little Calumet River within fifty feet north and south of the centerline of said river. "Crossing A" right-of-way. 16 USC 460u-15.

"SEC. 17. The Secretary shall enter into a cooperative agreement with the landowner of those lands north of the Little Calumet River between the Penn Central Railroad bridge within area II-E and 'Crossing A' within area IV-C. Such agreement shall provide that any roadway constructed by the landowner south of United States Route 12 within such vicinity shall include grading, landscaping, and plantings of vegetation designed to prevent soil erosion and to minimize the aural and visual impacts of said construction, and of traffic on such roadway, as perceived from the Little Calumet River. 16 USC 460u-16.

"SEC. 18. (a) The Secretary may not acquire such lands within the western section of area I-E, as designated on map numbered 626-91007, which have been used for solid waste disposal until he has received a commitment, in accordance with a plan acceptable to him, to reclaim such lands at no expense to the Federal Government. 16 USC 460u-17.

"(b) With respect to the property identified as area I-E on map numbered 626-91007, the Secretary may enter into a cooperative agree-

ment whereby the State of Indiana or any political subdivision thereof may undertake to develop, manage, and interpret such area in a manner consistent with the purposes of this Act.

Study, transmittal to congressional committees. 16 USC 460u-18.

"SEC. 19. By July 1, 1977, the Secretary shall prepare and transmit to the Committees on Interior and Insular Affairs of the United States Congress a study of areas III-A, III-C, and II-A, as designated on map numbered 626-91007. The Secretary shall make reasonable provision for the timely participation of the State of Indiana, local public officials, affected property owners, and the general public in the formulation of said study, including, but not limited to, the opportunity to testify at a public hearing. The record of such hearing shall accompany said study. With respect to areas III-A and III-C, the study shall (a) address the desirability of acquisition of any or all of the area from the standpoint of resource management, protection, and public access; (b) develop alternatives for the control of beach erosion if desirable, including recommendations, if control is necessary, of assessing the costs of such control against those agencies responsible for such erosion; (c) consider and propose options to guarantee public access to and use of the beach area, including the location of necessary facilities for transportation, health, and safety; (d) detail the recreational potential of the area and all available alternatives for achieving such potential; (e) review the environmental impact upon the lakeshore resulting from the potential development and improvement of said areas; and (f) assess the cost to the United States from both the acquisition of said areas together with the potential savings from the retention of rights of use and occupancy and from the retention of the boundaries of the lakeshore, as designated on map numbered 626-91007, including the costs of additional administrative responsibilities necessary for the management of the lakeshore, including the maintenance of public services in the town of Beverly Shores, Indiana. With respect to area II-A, the Secretary shall study and report concerning the following objectives: (a) preservation of the remaining dunes, wetlands, native vegetation, and animal life within the area; (b) preservation and restoration of the watersheds of Cowles Bog and its associated wetlands; (c) appropriate public access to and use of lands within the area; (d) protection of the area and the adjacent lakeshore from degradation caused by all forms of construction, pollution, or other adverse impacts including, but not limited to, the discharge of wastes and any excessive subsurface migration of water; and (e) the economic consequences to the utility and its customers of acquisition of such area.

Land acquisition, notice to congressional committees; publication in Federal Register. 16 USC 460u-19.

"SEC. 20. After notifying the Committees on Interior and Insular Affairs of the United States Congress, in writing, of his intentions to do so and of the reasons therefor, the Secretary may, if he finds that such lands would make a significant contribution to the purposes for which the lakeshore was established, accept title to any lands, or interests in lands, located outside the present boundaries of the lakeshore but contiguous thereto or to lands acquired under this section, such lands the State of Indiana or its political subdivisions may acquire and offer to donate to the United States or which any private person, organization, or public or private corporation may offer to donate to the United States and he shall administer such lands as a part of the lakeshore after publishing notice to that effect in the Federal Register.".

(9) Section 5 of such Act is hereby repealed, and the succeeding sections are redesignated accordingly. Repeal. 16 USC 460u–4.

Approved October 18, 1976.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 94–818 (Comm. on Interior and Insular Affairs).
SENATE REPORT No. 94–1189 (Comm. on Interior and Insular Affairs).
CONGRESSIONAL RECORD, Vol. 122 (1976):
Feb. 17, considered and passed House.
Sept. 24, considered and passed Senate, amended.
Sept. 29, House agreed to Senate amendment.
WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, Vol. 12, No. 43:
Oct. 19, Presidential statement.

Public Law 96-612
96th Congress

An Act

To provide for the establishment of the Indiana Dunes National Lakeshore, and for other purposes.

Dec. 28, 1980
[S. 2261]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act entitled "An Act to provide for the establishment of the Indiana Dunes National Lakeshore, and for other purposes", approved November 5, 1966 (80 Stat. 1309), as amended (16 U.S.C. 460u), is further amended as follows:

Indiana Dunes National Lakeshore, amendment.

(1) A new section is added at the end thereof to read as follows:

"SEC. 20. (a) The Indiana Dunes National Lakeshore is hereby dedicated to the memory of Paul H. Douglas in grateful recognition of his leadership in the effort to protect, preserve, and enhance the natural, scientific, historic, and recreational value of the lakeshore for the use, enjoyment, and edification of present and future generations.

Paul H. Douglas, dedication.
16 USC 460u-20.

"(b) To further accomplish the purposes of subsection (a) of this section, the Secretary of the Interior shall designate the west unit of the lakeshore as the 'Paul H. Douglas Ecological and Recreational Unit' and shall, subject to appropriations being granted, design and construct a suitable structure or designate an existing structure within the lakeshore to be known as the 'Paul H. Douglas Center for Environmental Education' which shall provide facilities designed primarily to familiarize students and other visitors with, among other things: (1) the natural history of the lakeshore and its association with the natural history of the Great Lakes region; (2) the evolution of human activities in the area; and (3) the historical features which led to the establishment of the lakeshore by the Congress of the United States.

"(c) To inform the public of the contributions of Paul H. Douglas to the creation of the lakeshore, the Secretary of the Interior shall provide such signs, markers, maps, interpretive materials, literature, and programs as he deems appropriate.".

16 USC 460u.

(2) Section 1 of the Act is amended by changing "September 1976 and bearing the number 626-91007" to "December 1980, and bearing the number 626-91014".

Land acquisition.
16 USC 460u-1.

(3) Section 2(a) of the Act is amended by adding the following new sentence at the end thereof: "The Secretary is expressly authorized to acquire by donation, purchase with donated or appropriated funds, or exchange, lands or interests therein which are owned for school or educational purposes by a State or a political subdivision thereof.".

(4) Section 2(b) of the Act is amended by changing the phrase "section 10" to "section 9".

16 USC 460u-3.

(5) In the first sentence of section 4 of the Act, preceding the word "February" insert: "January 1, 1981 or, in the case of improved property located within the boundaries delineated on a map identified as 'Boundary Map, Indiana Dunes National

Lakeshore', dated September 1976 and bearing the number 626-91007, before".

Use and occupancy rights. 16 USC 460u-5.

(6) The first sentence of section 5(a) of the Act is amended to read as follows: "Except for owners of improved property within the area on the map referred to in the first section of this Act as area II-B, any owner or owners of record of improved property may retain a right of use and occupancy of said improved property for noncommercial residential purposes for a term (1) ending on his or her death or the death of his or her spouse, whichever occurs last, or (2) for a fixed term not to extend beyond September 30, 2010, or such lesser term as the owner or owners may elect at the time of acquisition by the Secretary: *Provided,* That the retention of a retained right under clause numbered (1) shall only be available to homeowners of record as of October 1, 1980, who have attained the age of majority as of that date and make a bona fide written offer not later than October 1, 1985, to sell to the Secretary.".

(7) Section 5 of the Act is amended by adding a new subsection (c) as follows:

Use and occupancy rights, extension.

"(c) With respect to improved properties acquired prior to the enactment of this subsection and upon which a valid existing right of use and occupancy has been reserved for a term of not more than twenty years, the Secretary may, in his discretion, extend the term of such retained right for a period of not more than nine years upon receipt of payment prior to September 30, 1983, from the holder of the retained right. The amount of such payment shall be equivalent to the amount discounted from the purchase price paid by the Secretary for the identical period of time under the terms of the original sale adjusted by a general index adopted by the Secretary reflecting overall value trends within Indiana Dunes National Lakeshore between the time of the original sale and the time of the retained right of extension offered by this subsection.".

16 USC 460u-7.

(8) Section 7(a) of the Act is amended by changing "ten years after the date of establishment of the national lakeshore pursuant to this Act" to "on September 30, 1985".

(9) Section 7(b) of the Act is amended as follows:

(A) by striking out "eleven members" and inserting in lieu thereof "thirteen members";

(B) by striking out "one member who is a year-round resident" in clause (4) and inserting in lieu thereof "two members who are year-round residents"; and

(C) by striking out "one member who is a year-round resident" in clause (7) and inserting in lieu thereof "two members who are year-round residents".

Appropriation authorization. 16 USC 460u-9.

(10) Section 9 of the Act is amended as follows:

(A) in the first sentence, change "$9,440,000 for development" to "$11,000,000 for development: *Provided,* That not more than $500,000 of said amount may be appropriated for the development of the Paul H. Douglas Environmental Education Center authorized pursuant to section 20 of this Act."; and

Ante, p. 3575.

(B) at the end thereof, add a new paragraph as follows:

"In addition to any sums heretofore authorized for the acquisition of lands and interests in lands pursuant to the provisions of this Act, there are further authorized to be appropriated an additional $3,120,000.".

(11) A new section 21 is added to the Act as follows:

"SEC. 21. (a) The Secretary in consultation with the Secretary of Transportation, shall conduct a study of various modes of public access into and within the lakeshore which are consistent with the preservation of the lakeshore and conservation of energy by encouraging the use of transportation modes other than personal motor vehicles. Public access, study. 16 USC 460u-21.

"(b) In carrying out the study, the Secretary shall utilize to the greatest extent practicable the resources and facilities of the organizations designated as clearinghouses under title IV of the Intergovernmental Cooperation Act of 1968 as implemented by Office of Management and Budget Circular A-95, and which have comprehensive planning responsibilities in the regions where the lakeshore is located, as well as any other agencies or organizations which the Secretary may designate. The Secretary shall make provision for timely and substantive consultations with the appropriate agencies of the States of Indiana and Illinois, local elected officials, and the general public in the formulation and implementation of the study. Clearinghouse resources and facilities. 42 USC 4231.

"(c) The study shall address the adequacy of access facilities for members of the public who desire to visit and enjoy the lakeshore. Consideration shall be given to alternatives for alleviating the dependence on automobile transportation. The study of public transportation facilities shall cover the distance from cities of thirty-five thousand population or more within fifty miles of the lakeshore.

"(d) The study shall include proposals deemed necessary to assure equitable visitor access and public enjoyment by all segments of the population, including those who are physically or economically disadvantaged. It shall provide for retention of the natural, scenic, and historic values for which the lakeshore was established, and shall propose plans and alternatives for the protection and maintenance of these values as they relate to transportation improvements.

"(e) The study shall examine proposals for the renovation and preservation of a portion of the existing South Shore Railroad passenger car fleet. The study shall consider the historic value of the existing rolling stock and its role in transporting visitors into and within the lakeshore.

"(f) The study shall present alternative plans to improve, construct, and extend access roads, public transportation, and bicycle and pedestrian trails. It shall include cost estimates of all plans considered in this study, and shall discuss existing and proposed sources of funding for the implementation of the recommended plan alternatives.

"(g) The study shall be completed and presented to the Congress within two complete fiscal years from the effective date of this provision. Submittal to Congress.

"(h) Effective October 1, 1981, there is hereby authorized to be appropriated not to exceed $200,000 for this study.". Appropriation authorization.

(12) A new section 22 is added to the Act as follows:

"SEC. 22. In exercising his authority to acquire property under this Act, the Secretary shall give prompt and careful consideration to any offer made by an individual owning property within the lakeshore to sell such property, if such individual notifies the Secretary in writing that the continued ownership of such property is causing, or would result in, undue hardship.". Land acquisition, owner's hardship. 16 USC 460u-22.

(13) A new section 23 is added to the Act as follows:

"SEC. 23. (a) The Secretary may acquire only such interest in that portion of area VII-A which is described in subsection (b) as the Secretary determines is necessary to assure public access over said portion of area VII-A. Public access. 16 USC 460u-23.

"(b) The portion of area VII-A, as designated on the map referred to in section 1, to which subsection (a) applies is a parcel of land bounded—

"(1) on the east by a line three hundred feet east of the electrical transmission line crossing area VII-A on January 1, 1979;

"(2) on the west by a line fifty feet west of such electrical transmission line; and

"(3) on the north and south by the northern and southern boundaries, respectively, of area VII-A.

"(c) Area VII-A includes the bed of the railroad tracks forming the northern and northwestern boundaries of this area and extends to the northern edge of the bed of the railroad tracks forming the southern boundaries of this area.

"(d) Area I-D includes the bed of the railroad tracks along the northern boundary of this area.

"(e) The area designated as area VII-C on the map referred to in section 1 does not include approximately 1.3 acres of land on which the Linde Air Products plant is situated, nor does it include approximately 1 acre of land on which the Old Union Station building and the adjacent REA building are situated. Except as provided in the foregoing sentence, area VII-C extends to, but does not include, the beds of the railroad tracks forming the northern and southern boundaries of such area.".

Effective date. 16 USC 460u note.

SEC. 2. Authorizations of moneys to be appropriated under this Act shall be effective on October 1, 1981. Notwithstanding any other provision of this Act, authority to enter into contracts, to incur obligations, or to make payments under this Act shall be effective only to the extent, and in such amounts, as are provided in advance in appropriation Acts.

Approved December 28, 1980.

LEGISLATIVE HISTORY:

SENATE REPORT No. 96-1005 (Comm. on Energy and Natural Resources).
CONGRESSIONAL RECORD, Vol. 126 (1980):
Sept. 30, considered and passed Senate.
Dec. 11, considered and passed House, amended.
Dec. 12, Senate agreed to House amendments.

Public Law 99-583
99th Congress

An Act

Oct. 29, 1986
[H.R. 4037]

Relating to the Indiana Dunes National Lakeshore, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

National parks, monuments, etc.
Housing.
Real property.

SECTION 1. INDIANA DUNES NATIONAL LAKESHORE.

(a) BOUNDARY CHANGES.—The first section of the Act entitled "An Act to provide for the establishment of the Indiana Dunes National Lakeshore, and for other purposes", approved November 5, 1966 (16 U.S.C. 460u), is amended by striking out "December 1980, and bearing the number 626-91014" and inserting in lieu thereof "October 1986, and numbered 626-80,033-B".

16 USC 460u-3.

(b) DEFINITION OF IMPROVED PROPERTY.—Section 4 of such Act is amended by striking out the first sentence and substituting "As used in this Act, the term 'improved property' means a detached, one-family dwelling which meets each of the following criteria:

"(1) The construction of the dwelling began before the date (shown in the table contained in this section) corresponding to the appropriate map.

"(2) The property is located within the boundaries delineated on the map described in such table which corresponds to such date.

"(3) The property is not located within the boundaries of any other map referred to in such table which bears an earlier date.

The term 'appropriate map', means a map identified as 'Boundary Map—Indiana Dunes National Lakeshore' (or 'A Proposed Indiana Dunes National Lakeshore' in the case of a dwelling the construction of which was begun before January 4, 1965) which is dated and numbered as provided in the following table.

Property Within Boundaries of Map	Construction Began Before
Dated October 1986, #626-80,033-B	February 1, 1986
Dated December 1980, #626-91014	January 1, 1981
Dated September 1976, #626-91007	February 1, 1973
Dated September 1966, #LNPNE-1008-ID	January 4, 1965

The term 'improved property' also includes the lands on which the dwelling is situated which meets both of the following criteria:

"(A) The land is in the same ownership as the dwelling.

"(B) The Secretary has designated the lands as reasonably necessary for the enjoyment of the dwelling for the sole purpose of noncommercial residential use.

Public information.

Such term also includes any structures accessory to the dwelling which are situated on the lands so designated. The maps referred to in this section shall be on file and available for public inspection in the Office of the Director of the National Park Service, Department

of the Interior. The Secretary shall designate the land referred to in subparagraph (B).".

(c) RETAINED RIGHTS.—Section 5(a) of such Act (16 U.S.C. 460u-5a) is amended as follows: 16 USC 460u-5.

(1) Strike out "the first section" and insert in lieu thereof "section 4, dated December 1980, and numbered 626-91014." *Ante*, p. 3318.

(2) Strike out ": *Provided*, That" and substitute a period followed by "In the case of improved property within the boundaries of the map dated December 1980 and numbered 626-91014".

(3) After "(a)" strike "Except for" and insert "(1) Except for owners described in paragraph (2) and".

(4) Strike "(1)" in each place it appears and substitute "(A)" and strike "(2)" and substitute "(B)".

(5) Add the following at the end thereof:

"(2)(A) In the case of property included within the boundaries of the lakeshore after 1980, any owner or owners of record of improved property may retain a right of use and occupancy for noncommercial residential purposes for a term ending at either of the following:

"(i) A fixed term not to extend beyond September 30, 2010, or such lesser fixed term as the owner or owners may elect at the time of acquisition.

"(ii) A term ending at the death of any owner or of a spouse of any owner, whichever occurs last.

The owner shall elect the term to be reserved.

"(B) The retention of rights under subparagraph (A) shall be available only to individuals who are homeowners of record as of July 1, 1986, who have attained the age of majority as of that date and who make a bona fide written offer not later than July 1, 1991, to sell to the Secretary.".

(d) AUTHORIZATION.—Section 9 of such Act (16 U.S.C. 460u-9) is amended as follows:

(1) In the first sentence strike "$11,000,000" and insert in lieu thereof "$20,000,000".

(2) Add after the last paragraph "In addition to any other sums authorized for the acquisition of lands and interests in lands pursuant to the provisions of this Act there are authorized to be appropriated an additional $3,500,000 to be used for such purposes. The Secretary shall conduct a feasibility study of establishing United States Highway 12 as the 'Indiana Dunes Parkway' under the jurisdiction of the National Park Service. The Secretary shall submit the results of such study to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate within two years after the enactment of this sentence. Effective October 1, 1986, there is authorized to be appropriated such sums as may be necessary for the purposes of conducting the feasibility study.". Highways.

(e) EXISTING PROPERTY RIGHTS.—Section 10 of such Act (16 U.S.C. 460u-16) is amended by inserting at the end thereof: "Nothing in this Act shall be construed to diminish the existing property rights of Northern Indiana Public Service Company (as of October 1, 1986) with respect to— Energy. 16 USC 460u-10.

"(1) a parcel of land owned in fee by the Northern Indiana Public Service Company and used for high voltage electrical transmission lines, pipelines, and utility purposes, beginning at said Company's Dune Acres substation and extending east to

said Company's Michigan City Generating Station, which parcel by this Act is included within the boundaries of the Indiana Dunes National Lakeshore and herein designated as area II-I on National Park Service Boundary Map No. 626-80,033-B, dated October 1986, excluding that certain parcel of approximately 6.0 acres adjacent Mineral Springs Road in areas II-I, and

(2) land owned in fee by the Northern Indiana Public Service Company and used for high voltage electrical transmission lines, pipelines, and utility purposes as has by this Act been included within the boundaries of the Indiana Dunes National Lakeshore and herein designated as area II-H on said National Park Service Boundary Map No. 626-80,033-B."

(f) OWNER CONSENT REQUIRED.—Section 13 of such Act (16 U.S.C. 460u-13) is amended by changing "SEC. 13." to "SEC. 13. (a)", by striking out "the first section" and inserting in lieu thereof "section 4, dated December 1980 and numbered 626-91014", and by adding a new subsection (b) as follows:

Ante, p. 3318.

"(b) The Secretary may acquire that portion of area IV-B in private ownership on the map referred to in section 1 of this Act only with the consent of the owner: *Provided,* That the Secretary may acquire an agricultural easement should the owner change the use in existence as of September 19, 1986, through eminent domain.".

Ante, p. 3318.

(g) MAP REFERENCE.—Section 16 of such Act (16 U.S.C. 460u-16) is amended by inserting at the end of the first sentence "on the map referred to in section 4, dated October 1976, and numbered 626-9100".

16 USC 460u-15.

(h) RIGHTS-OF-WAY.—Section 15 of such Act is amended by adding the following at the end thereof: "The Secretary may acquire only such interest in the rights-of-way designated 'Crossing B' and 'Crossing C' on the map dated October 1986 and numbered 626-80,033-B as he determines to be necessary to assure public access to the banks of the Little Calumet River and the banks of Salt Creek within fifty feet on either side of the centerline of said river and creek.".

(i) COOPERATIVE AGREEMENT AND STUDY.—Add the following new section at the end of such Act:

16 USC 460u-24.
Contracts.

"SEC. 24. LITTLE CALUMET RIVER AND BURNS/PORTAGE WATERWAY.

"(a) COOPERATIVE AGREEMENT.—The Secretary may enter into a cooperative agreement with the Little Calumet River Basin Development Commission, the State of Indiana or any political subdivision thereof for the planning, management, and interpretation of recreational facilities on the tract within the boundaries of Indiana Dunes National Lakeshore identified as tract numbered 09-177 or on lands under the jurisdiction of the State of Indiana or political subdivision thereof along the Little Calumet River and Burns Waterway. The cooperative agreement may include provision for the planning of public facilities for boating, canoeing, fishing, hiking, bicycling, and other compatible recreational activities. Any recreational developments on lands under the jurisdiction of the National Park Service planned pursuant to this cooperative agreement shall be in a manner consistent with the purposes of this Act, including section 6(b).

Boating.
Canoeing.
Fish and fishing.
Hiking.
Bicycling.

16 USC 460u-6.

"(b) STUDY.—The Secretary shall conduct a study regarding the options available for linking the portions of the lakeshore which are divided by the Little Calumet River and Burns/Portage Waterway

so as to coordinate the management and recreational use of the lakeshore. The Secretary shall submit the results of the study to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate within two years after the enactment of this section. Effective October 1, 1986, there is authorized to be appropriated such sums as may be necessary for the purposes of conducting the study.".

Effective date. Appropriation authorization.

Approved October 29, 1986.

LEGISLATIVE HISTORY—H.R. 4037:

HOUSE REPORTS: No. 99-762 (Comm. on Interior and Insular Affairs).
CONGRESSIONAL RECORD, Vol. 132 (1986):
Aug. 11, considered and passed House.
Oct. 16, considered and passed Senate, amended.
Oct. 17, House concurred in Senate amendment.

Public Law 102-430
102d Congress

An Act

Oct. 23, 1992
[H.R. 1216]

To modify the boundaries of the Indiana Dunes National Lakeshore, and for other purposes.

Indiana Dunes National Lakeshore Access and Enhancement Act. Conservation. 16 USC 460u note.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Indiana Dunes National Lakeshore Access and Enhancement Act".

SEC. 2. DEFINITION.

For the purposes of this Act, the term "the Act" means the Act entitled "An Act to provide for the establishment of the Indiana Dunes National Lakeshore, and for other purposes", approved November 5, 1966, as amended (16 U.S.C. 460u et seq.).

SEC. 3. BOUNDARIES.

(a) IN GENERAL.—The first section of the Act (16 U.S.C. 460u) is amended by striking "October 1986, and numbered 62680033–B" and inserting "October 1992, and numbered 626–80,039–C".

(b) CRESCENT DUNE.—Section 12 of the Act (16 U.S.C. 460u–12) is repealed.

SEC. 4. IMPROVED PROPERTY; RETENTION OF RIGHTS.

(a) ADDITIONAL AREAS.—The table in section 4 of the Act (16 U.S.C. 460u–3) is amended to read as follows:

"Property within boundaries of map	Construction began before
Dated October 1992, No. 626–80,039–C	October 1, 1991
Dated October 1986, No. 626–80,033–B	February 1, 1986
Dated December 1980, No. 626–91014	January 1, 1981
Dated September 1976, No. 626–91007	February 1, 1973
Dated September 1966, No. LNPNE–1008–ID	January 4, 1965".

(b) RETENTION OF RIGHTS.—Section 5(a) of the Act (16 U.S.C. 460u–5(a)) is amended by adding at the end thereof the following new paragraph:

"(3)(A) In the case of improved property included within the boundaries of the lakeshore after October 1, 1991, that was not included within such boundaries on or before that date, an individual who is an owner of record of such property as of that date may retain a right of use and occupancy of such improved property for noncommercial residential purposes for a term ending at either of the following:

"(i) A fixed term not to extend beyond October 1, 2020, or such lesser fixed term as the owner may elect at the time of acquisition.

"(ii) A term ending at the death of the owner or the owner's spouse, whichever occurs later. The owner or owners shall elect the term to be reserved.

"(B) Subparagraph (A) shall apply only to improved property owned by an individual who—

"(i) was an owner of record of the property as of October 1, 1991;

"(ii) had attained the age of majority as of that date; and

"(iii) made a bona fide written offer not later than October 1, 1997, to sell the property to the Secretary.".

(c) TECHNICAL AMENDMENT.—Section 5(a)(1) of the Act (16 U.S.C. 460u–5(a)(1)) is amended by striking the period after "626–91014" the first place it appears and inserting a comma.

SEC. 5. GREENBELT.

Section 18 of the Act (16 U.S.C. 460–18) is amended— 16 USC 460u–18.

(1) by inserting "(a)" after "SEC. 18."; and

(2) by adding at the end the following new subsection:

"(b)(1) The Secretary shall enter into a memorandum of agreement with the Northern Indiana Public Service Company (referred to as 'NIPSCO') that shall provide for the following with respect to the area referred to as Unit II–A on the map described in the first section of this Act (referred to as the 'Greenbelt'): Contracts. Northern Indiana Public Service Company.

"(A) NIPSCO shall provide the National Park Service with access for resource management and interpretation through the Greenbelt and across the dike for purposes of a public hiking trail.

"(B) The National Park Service shall have rights of access for resource management and interpretation of the Greenbelt area.

"(C) NIPSCO shall preserve the Greenbelt in its natural state. If NIPSCO utilizes the Greenbelt temporarily for a project involving pollution mitigation or construction on its adjacent facilities, it shall restore the project area to its natural state.

"(D) If NIPSCO proposes a different use for the Greenbelt, NIPSCO shall notify the National Park Service, the Committee on Energy and Natural Resources of the Senate and the Committee on Interior and Insular Affairs of the House of Representatives and make no change in the use of the property until three years after the date notice is given.

"(2) If a memorandum of agreement is entered into pursuant to paragraph (1), so long as the memorandum of agreement is in effect and is being performed, the Secretary may not acquire lands or interests in land in the Greenbelt belonging to NIPSCO.".

SEC. 6. COOPERATIVE AGREEMENT.

The Act is amended by adding at the end the following new section:

"SEC. 25. In furtherance of the purposes of this Act, the Secretary may enter into a cooperative agreement with the city of Gary, Indiana, pursuant to which the Secretary may provide technical assistance in interpretation, planning, and resource management for programs and developments in the city of Gary's Marquette Park and Lake Street Beach.". 16 USC 460u–25.

SEC. 7. UNIT VII–D AND I–M.

The Act, as amended by section 5, is further amended by adding at the end the following new section:

"SEC. 26(a). Before acquiring lands or interests in lands in Unit VII–D (as designated on the map described in the first section of this Act) the Secretary shall consult with the Commissioner of the Indiana Department of Transportation to determine what 16 USC 460u–26.

lands or interests in lands are required by the State of Indiana for improvements to 15th Avenue (including the extension known as Old Hobart Road) and reconstruction and relocation of the intersection of 15th Avenue and State Road 51 so that the acquisition by the Secretary of lands or interests in lands in Unit VII–D will not interfere with planned improvements to the interchange and 15th Avenue in the area.

"(b) Before acquiring lands or interests in lands in Unit I–M (as designated on the map referred to in the first section of this Act) the Secretary shall consult with the Commissioner of the Indiana Department of Transportation to determine what lands or interests in lands are required by the State of Indiana for improvements to State Road 49 and reconstruction and relocation of the interchange with State Road 49 and U.S. 20 so that the acquisition by the Secretary of lands or interests in lands in Unit I–M will not interfere with planned improvements to such interchange and State Road 49 in the area.".

SEC. 8. VISITOR CENTER.

Dorothy Buell.

In order to commemorate the vision, dedication, and work of Dorothy Buell in saving the Indiana Dunes, the National Park Service visitor center at the Indiana Dunes National Lakeshore is designated as the "Dorothy Buell Memorial Visitor Center".

SEC. 9. AUTHORIZATION OF APPROPRIATIONS.

Section 9 of the Act (16 U.S.C. 460u–9) is amended—

(1) in the first sentence by striking the words "The Secretary may not expend more than $60,812,100 from the Land and Water Conservation Fund for the acquisition of lands and interests in lands nor more than $20,000,000 for development:" and inserting in lieu thereof: "The Secretary may expend such sums as may be necessary from the Land and Water Conservation Fund for acquisition of lands and interests in lands, and not to exceed $27,500,000 for development:";

(2) by striking the second paragraph in its entirety; and

(3) by striking the first sentence of the third paragraph.

Approved October 23, 1992.

LEGISLATIVE HISTORY—H.R. 1216:

HOUSE REPORTS: No. 102-151 (Comm. on Interior and Insular Affairs).
SENATE REPORTS: No. 102-340 (Comm. on Energy and Natural Resources).
CONGRESSIONAL RECORD:
Vol. 137 (1991): July 15, considered and passed House.
Vol. 138 (1992): July 29, considered and passed Senate, amended.
Oct. 5, House concurred in Senate amendment with amendments.
Oct. 8, Senate concurred in House amendments.

Compilation of Legislation

An Act

To provide for the establishment of the Indiana Dunes National Lakeshore, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to preserve for the educational, inspirational, and recreational use of the public certain portions of the Indiana dunes and other areas of scenic, scientific, and historic interest and recreational value in the State of Indiana, the Secretary of the Interior is authorized to establish and administer the Indiana Dunes National Lakeshore (hereinafter referred to as the "lakeshore") in accordance with the provisions of this Act. The lakeshore shall comprise the area within the boundaries delineated on a map identified as "'Boundary Map, Indiana Dunes National Lakeshore', dated October 1992, and numbered 626-80,039-C" which map is on file and available for public inspection in the Office of the Director of the National Park Service, Department of the Interior.

Sec. 2. (a) Within the boundaries of the lakeshore the Secretary of the Interior (hereinafter referred to as the "Secretary") is authorized to acquire lands, waters, and other property, or any interest therein, by donation, purchase with donated or appropriated funds, exchange, or otherwise. The Indiana Dunes State Park may be acquired only by donation of the State of Indiana, and the Secretary is hereby directed to negotiate with the State for the acquisition of said park. In exercising his authority to acquire property by exchange for the purposes of this Act, the Secretary may accept title to non-Federal property located within the area described in section 1 of this Act and convey to the grantor of such property any federally owned property under the jurisdiction of the Secretary which he classifies as suitable for exchange or other disposal within the State of Indiana or Illinois. Properties so exchanged shall be approximately equal in fair market value, as determined by the Secretary who may, in his discretion, base his determination on an independent appraisal obtained by him: Provided, That the Secretary may accept cash from or pay cash to the grantor in such an exchange in order to equalize the values of the properties exchanged. The Secretary is expressly authorized to acquire by donation, purchase with donated or appropriated funds, or exchange, lands or interests therein which are owned for school or educational purposes by a State or a political subdivision thereof.

(b) In exercising his authority to acquire property under subsection (a) of this section, the Secretary may enter into contracts requiring the expenditure, when appropriated, of funds authorized to be appropriated by section 9 of this Act, but the liability of the United States under any such contract shall be contingent on the appropriation of funds sufficient to fulfill the obligations thereby incurred.

Sec. 3. As soon as practicable after the effective date of this Act and following the acquisition by the Secretary of an acreage within the boundaries of the area described in section 1 of this Act which in his opinion is efficiently administrable for the purposes of this Act, he shall establish the Indiana Dunes National Lakeshore by publication of notice thereof in the Federal Register. By no later than October 1, 1977, the Secretary shall publish in the Federal Register a detailed description of the boundaries of the lakeshore and shall from time to time so publish any additional boundary changes as may occur. Following such establishment and subject to the limitations and conditions prescribed in section 1 hereof, the Secretary may continue to acquire lands and interests in lands for the lakeshore.

Sec. 4. As used in this Act, the term 'improved property' means detached, one-family dwelling which meets each of the following and construction criteria:

(1) The construction of the dwelling began before the date (shown in the table contained in this section) corresponding to the appropriate map.
(2) The property is located within the boundaries delineated on the map described in such table which corresponds to such date.
(3) The property is not located within the boundaries of any other map referred to in such table which bears an earlier date.

The term 'appropriate map', means a map identified as 'Boundary Map--Indiana Dunes National Lakeshore' (or 'A Proposed Indiana Dunes National Lakeshore' in the case of a dwelling the construction of which was begun before January 4, 1965) which is dated and numbered as provided in the following table.

Property Within Boundaries of Map	Construction Began Before
Dated October 1992, No. 626-80,039-C	October 1, 1991
Dated October 1986, No. 626-80,033-B	February 1, 1986
Dated December 1980, No. 626-91014	January 1, 1981
Dated September 1976, No. 626-91007	February 1, 1973
Dated September 1966, No. LNPNE-1008-ID	January 4, 1965

The term 'improved property' also includes the lands on which the dwelling is situated which meets both of the following criteria:
(A) The land is in the same ownership as the dwelling.
(B) The Secretary has designated the lands as reasonably necessary for the enjoyment of the dwelling for the sole purpose of noncommercial residential use.

Such term also includes any structures accessory to the dwelling which are situated on the lands so designated. The maps referred to in this section shall be on file and available for public inspection in the Office of the Director of the National Park Service, Department of the Interior. The Secretary shall designate the land referred to in subparagraph (B). The amount of land so designated shall in every case be not more than three acres in area, and in making such designation the Secretary shall take into account the manner of noncommercial residential use in which the dwelling and land have customarily been enjoyed: Provided, That the Secretary may exclude from the land so designated any beach or waters, together with so much of the land adjoining such beach or waters, as he may deem necessary for public access thereto or public use thereof. All rights of use and occupancy shall be subject to such terms and conditions as the Secretary deems appropriate to assure the use of such property in accordance with the purposes of this Act.

Sec. 5. (a) (1) Except for owners described in paragraph (2) and owners of improved property within the area on the map referred to in section 4, dated December 1980, and numbered 626-91014, of this act as area II-B, any owner or owners of record of improved property may retain a right of use and occupancy of said improved property for noncommercial residential purposes for a term (A) ending on his or her death or the death of his or her spouse, whichever occurs last, or (B) for a fixed term not to extend beyond September 30, 2010, or such lesser term as the owner or owners may elect at the time of acquisition by the Secretary.

In the case of improved property within the boundaries of the map dated December 1980 and numbered 626-91014 the retention of a retained right under clause numbered (A) shall only be

available to homeowners of record as of October 1, 1980, who have attained the age of majority as of that date and make a bona fide written offer not later than October 1, 1985, to sell to the Secretary. Where any such owner retains a right of use and occupancy as herein provided, such right during its existence may be conveyed or leased for noncommercial residential purposes. The Secretary shall pay to the owner the fair market value of the property on the date of such acquisition, less the fair market value on such date of the right retained by the owner.

(2)(A) In the case of property included within the boundaries of the lakeshore after 1980, any owner or owners of record of improved property may retain a right of use and occupancy for noncommercial residential purposes for a term ending at either of the following:

(i) A fixed term not to extend beyond September 30, 2010, or such lesser fixed term as the owner or owners may elect at the time of acquisition.

(ii) A term ending at the death of any owner or of a spouse of any owner, whichever occurs last.

The owner shall elect the term to be reserved.

(B) The retention of rights under subparagraph (A) shall be available only to individuals who are homeowners of record as of July 1, 1986, who have attained the age of majority as of that date and who make a bona fide written offer not later than July 1, 1991, to sell to the Secretary.

(3)(A) In the case of improved property included within the boundaries of the lakeshore after October 1, 1991, that was not included within such boundaries on or before that date, an individual who is an owner of record of such property as of that date may retain a right of use and occupancy of such improved property for noncommercial residential purposes for a term ending at either of the following:

(i) A fixed term not to extend beyond October 1, 2020, or such lesser fixed term as the owner may elect at the time of acquisition.

(ii) A term ending at the death of the owner or the owner's spouse, whichever occurs later.

The owner or owners shall elect the term to be reserved.

(B) Subparagraph (A) shall apply only to improved property owner by an individual who:

(i) was an owner of record of the property as of October 1, 1991;

(ii) had attained the age of majority as of that date; and

(iii) made a bona fide written offer not later than October 1, 1997, to sell the property to the Secretary.

(b) Upon his determination that the property, or any portion thereof, has ceased to be used in accordance with the applicable terms and conditions, the Secretary may terminate a right of use and occupancy. Nonpayment of property taxes, validly assessed, on any retained right of use and occupancy shall also be grounds for termination of such right by the Secretary. In the event the Secretary terminates a right of use and occupancy under this subsection he shall pay to the owners of the retained right so terminated an amount equal to the fair market value of the portion of said right which remained unexpired on the date of termination. With respect to any right of use and occupancy in existence on the effective date of this sentence, standards for retention of such rights in effect at the time such rights were reserved shall constitute the terms and conditions referred to in section 4.

(c) With respect to improved properties acquired prior to the enactment of this subsection and upon which a valid existing right of use and occupancy has been reserved for a term of not more than twenty years, the Secretary may, in his discretion, extend the term of such retained right for a period of not more than nine years upon receipt of payment prior to September 30, 1983, from the

holder of the retained right. The amount of such payment shall be equivalent to the amount discounted from the purchase price paid by the Secretary for the identical period of time under the terms of the original sale adjusted by a general index adopted by the Secretary reflecting overall value trends within Indiana Dunes National Lakeshore between the time of the original sale and the time of the retained right of extension offered by this subsection.

Sec. 6. (a) In the administration of the lakeshore the Secretary may utilize such statutory authorities relating to areas of the national park system and such statutory authority otherwise available to him for the conservation and management of natural resources as he deems appropriate to carry out the purposes of this Act.

(b) In order that the lakeshore shall be permanently preserved in its present state, no development or plan for the convenience of visitors shall be undertaken therein which would be incompatible with the preservation of the unique flora and fauna or the physiographic conditions now prevailing or with the preservation of such historic sites and structures as the Secretary may designate: Provided, That the Secretary may provide for the public enjoyment and understanding of the unique natural, historic, and scientific features within the lakeshore by establishing such trails, observation points, and exhibits and providing such services as he may deem desirable for such public enjoyment and understanding: Provided further, That the Secretary may develop for appropriate public uses such portions of the lakeshore as he deems especially adaptable for such uses.

Sec. 7. (a) There is hereby established an Indiana Dunes National Lakeshore Advisory Commission. Said Commission shall terminate on September 30, 1985.

(b) The Commission shall be composed of thirteen members each appointed for a term of two years by the Secretary, as follows:

(1) one member who is a year-round resident of Porter County to be appointed from recommendations made by the commissioners of such county; (2) one member who is a year-round resident of the town of Beverly Shores to be appointed from the recommendations made by the board of such town; (3) one member who is a year-round resident of the towns of Porter, Dune Acres, Pines, Chesterton, Ogden Dunes, or the village of Tremont, such member to be appointed from recommendations made by the boards of trustees or the trustee of the affected town or township; (4) two members who are year-round residents of the city of Michigan City to be appointed from recommendations made by such city; (5) two members to be appointed from recommendations made by the Governor of the State of Indiana;

(6) one member to be designated by the Secretary; (7) two members who are year-round residents of the city of Gary to be appointed from recommendations made by the mayor of such city; (8) one member to be appointed from recommendations made by a regional planning agency established under the authority of the laws of the State of Indiana and composed of representatives of local and county governments in northwestern Indiana; (9) one member who is a year-round resident of the city of Portage to be appointed from recommendations made by the mayor of such city; and (10) one member who holds a reservation of use and occupancy and is a year-round resident within the lakeshore to be designated by the Secretary.

(c) The Secretary shall designate one member to be Chairman. Any vacancy in the Commission shall be filled in the same manner in which the original appointment was made.

(d) A member of the Commission shall serve without compensation as such. The Secretary is authorized to pay the expense reasonably incurred by the Commission in carrying out its responsibilities under this Act on vouchers signed by the Chairman.

(e) The Secretary or his designee shall, from time to time, consult with the Commission with respect to matters relating to the development of the Indiana Dunes National Lakeshore and with respect to the provisions of sections 4, 5, and 6 of this Act.

(f) The Advisory Commission is authorized to assist with the identification of economically and environmentally acceptable areas, outside of the boundaries of the lakeshore, for the handling and

disposal of industrial solid wastes produced by the coal-fired powerplant in Porter County, Indiana, section 21, township 37 north, range 6 west.

Sec. 8. Nothing in this Act shall deprive the State of Indiana or any political subdivision thereof of its civil and criminal jurisdiction over persons found, acts performed, and offenses committed within the boundaries of the Indiana Dunes National Lakeshore or of its right to tax persons, corporations, franchises, or other non-Federal property on lands included therein.

Sec. 9. The Secretary may expend such sums as may be necessary from the Land and Water Conservation Funds for acquisition of lands and interests in lands, and not to exceed $27,500,000 for development: Provided, That not more than $500,000 of said amount may be appropriated for the development of the Paul H. Douglas Environmental Education Center authorized pursuant to section 20 of this Act; and By October 1, 1979, the Secretary shall develop and transmit to the Committees on Interior and Insular Affairs of the United States Congress a general management plan detailing the development of the national lakeshore consistent with the preservation objectives of this Act, indicating: (1) the facilities needed to accommodate the health, safety, and recreation needs of the visiting public; (2) the location and estimated costs of all facilities, together with a review of the consistency of the master plan with State, areawide, and local governmental development plans; (3) the projected need for any additional facilities within the national lakeshore; and (4) specific opportunities for citizen participation in the planning and development of proposed facilities and in the implementation of the general management plan generally.

The Secretary shall conduct a feasibility study of establishing United States Highway 12 as the 'Indiana Dunes Parkway' under the jurisdiction of the National Park Service. The Secretary shall submit the results of such study to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate within two years after the enactment of this sentence. Effective October 1, 1986, there is authorized to be appropriated such sums as may be necessary for the purposes of conducting the feasibility study.

Sec. 10. Nothing in this Act shall diminish any existing (as of March 1, 1975) rights-of-way or easements which are necessary for high voltage electrical transmission, pipelines, water mains, or line-haul railroad operations and maintenance. Nothing in this Act shall be construed to diminish the existing property rights of Northern Indiana Public Service Company (as of October 1, 1986) with respect to--

(1) a parcel of land owned in fee by the Northern Indiana Public Service Company and used for high voltage electrical transmission lines, pipelines, and utility purposes, beginning at said Company's Dune Acres substation and extending east to said Company's Michigan City Generating Station, which parcel by this Act is included within the boundaries of the Indiana Dunes National Lakeshore and herein designated as area II-I on National Park Service Boundary Map No. 626-80,033-B, dated October 1986, excluding that certain parcel of approximately 6.0 acres adjacent to Mineral Springs Road in area II-I, and

(2) land owned in fee by the Northern Indiana Public Service Company and used for high voltage electrical transmission lines, pipelines, and utility purposes as has by this Act been included within the boundaries of the Indiana Dunes National Lakeshore and herein designated as area II-H on said National Park Service Boundary Map No. 626-80,033-B.

Sec. 11. (a) Nothing in the Act shall be construed as prohibiting any otherwise legal cooling, process, or surface drainage into the part of the Little Calumet River located within the lakeshore: Provided, That this subsection shall not affect nor in any way limit the Secretary's authority and responsibility to protect park resources.

(b) The authorization of lands to be added to the lakeshore by the Ninety-fourth Congress and the

administration of such lands as part of the lakeshore shall in and of itself in no way operate to render more restrictive the application of Federal, State, or local air and water pollution standards to the uses of property outside the boundaries of the lakeshore, nor shall it be construed to augment the control of water and air pollution sources in the State of Indiana beyond that required pursuant to applicable Federal, State, or local law.

Sec. 12. DELETED

Sec. 13. (a) The Secretary may acquire that portion of area I-C Area which is shaded on the map referred to in section 4, dated December 1980 and numbered 626-91014 of this Act only with the consent of the owner unless the present owner attempts to sell or otherwise dispose of such area.
(b) The Secretary may acquire that portion of area IV-B in private ownership on the map referred to in section 1 of this Act only with the consent of the owner: Provided, That the Secretary may acquire an agricultural easement should the owner change the use in existence as of September 19, 1986, through eminent domain.

Sec. 14. Within one year after the date of the enactment of this section, the Secretary shall submit, in writing, to the Committees on Interior and Insular Affairs and to the Committees on Appropriations of the United States Congress a detailed plan which shall indicate: (1) the lands which he has previously acquired by purchase, donation, exchange, or transfer for administration for the purpose of the lakeshore; and (2) the annual acquisition program (including the level of funding) which he recommends for the ensuing five fiscal years.

Sec. 15. The Secretary may acquire only such interest in the right-of-way designated 'Crossing A' on map numbered 626-91007 as he determines to be necessary to assure public access to the banks of the Little Calumet River within fifty feet north and south of the centerline of said river. The Secretary may acquire only such interest in the rights-of-way designated 'Crossing B' and 'Crossing C' on the map dated October 1986 and numbered 626-80,033-B as he determines to be necessary to assure public access to the banks of the Little Calumet River and the banks of Salt Creek within fifty feet on either side of the centerline of said river and creek.

Sec. 16. The Secretary shall enter into a cooperative agreement with the landowner of those lands north of the Little Calumet River between the Penn Central Railroad bridge within area II-E and 'Crossing A' within area IV-C on the map referred to in section 4, dated October 1976, and numbered 626-91007. Such agreement shall provide that any roadway constructed by the landowner south of United States Route 12 within such vicinity shall include grading, landscaping, and plantings of vegetation designed to prevent soil erosion and to minimize the aural and visual impacts of said construction, and of traffic on such roadway, as perceived from the Little Calumet River.

Sec. 17. (a) The Secretary may not acquire such lands within Area I-E. the western section of area I-E, as designated on map numbered 626-91007, which have been used for solid waste disposal until he has received a commitment in accordance with a plan acceptable to him, to reclaim such lands at no expense to the Federal Government.
(b) With respect to the property identified as area I-E on map numbered 626-91007, the Secretary may enter into a cooperative agreement whereby the State of Indiana or any political subdivision thereof may undertake to develop, manage and interpret such area in a manner consistent with the purposes of this Act.

Sec. 18. (a) By July 1, 1977, the Secretary shall prepare and transmit to the Committees on Interior and Insular Affairs of the United States Congress a study of areas III-A, III-C, and II-A, as designated on map numbered 626-91007. The Secretary shall make reasonable provision for the

timely participation of the State of Indiana, local public officials, affected property owners, and the general public in the formulation of said study, including, but not limited to, the opportunity to testify at a public hearing. The record of such hearing shall accompany said study. With respect to areas III-A and III-C, the study shall (a) address the desirability of acquisition of any or all of the area from the standpoint of resource management, protection, and public access; (b) develop alternatives for the control of beach erosion if desirable, including recommendations, if control is necessary, of assessing the costs of such control against those agencies responsible for such erosion; (c) consider and propose options to guarantee public access to and use of the beach area, including the location of necessary facilities for transportation, health, and safety; (d) detail the recreational potential of the area and all available alternatives for achieving such potential; (e) review the environmental impact upon the lakeshore resulting from the potential development and improvement of said areas; and (f) assess the cost to the United States from both the acquisition of said areas together with the potential savings from the retention of rights of use and occupancy and from the retention of the boundaries of the lakeshore, as designated on map numbered 626-91007, including the costs of additional administrative responsibilities necessary for the management of the lakeshore, including the maintenance of public services in the town of Beverly Shores, Indiana. With respect to area II-A, the Secretary shall study and report concerning the following objectives: (a) preservation of the remaining dunes, wetlands, native vegetation, and animal life within the area; (b) preservation and restoration of the watersheds of Cowles Bog and its associated wetlands; (c) appropriate public access to and use of lands within the area; (d) protection of the area and the adjacent lakeshore from degradation caused by all forms of construction, pollution, or other adverse impacts including, but not limited to, the discharge of wastes and any excessive subsurface migration of water; and (e) the economic consequences to the utility and its customers of acquisition of such area.

(b)(1) The Secretary shall enter into a memorandum of agreement with the Northern Indiana Public Service Company (referred to as 'NIPSCO') that shall provide for the following with respect to the area referred to as Unit II-A on the map described in the first section of this Act (referred to as the "Greenbelt"):

(A) NIPSCO shall provide the National Park Service with access for resource management and interpretation through the Greenbelt and across the dike for purposes of a public hiking trail.

(B) The National Park Service shall have rights of access for resource management and interpretation of the Greenbelt area.

(C) NIPSCO shall preserve the Greenbelt in its natural state. If NIPSCO utilizes the Greenbelt temporarily for a project involving pollution mitigation or construction on its adjacent facilities, it shall restore the project area to its natural state.

(D) If NIPSCO proposes a different use for the Greenbelt, NIPSCO shall notify the National Park Service, the Committee on Energy and Natural Resources of the Senate and the Committee on Interior and Insular Affairs of the House of Representatives and make no change in the use of the property until 3 years after the date notice is given.

(2) If a memorandum of agreement is entered into pursuant to paragraph (1), so long as the memorandum of agreement is in effect and is being performed, the Secretary may not acquire lands or interests in land in the Greenbelt belonging to NIPSCO.

Sec. 19. After notifying the Committees on Interior and Insular Affairs of the United States Congress, in writing, of his intentions to do so and of the reasons therefore, the Secretary may, if he finds that such lands would make a significant contribution to the purposes for which the lakeshore was established, accept title to any lands, or interests in lands, located outside the present boundaries of the lakeshore but contiguous thereto or to lands acquired under this section, such lands the State of Indiana or its political subdivisions may acquire and offer to donate to the United States or which any private person, organization, or public or private corporation may offer to donate to the United States and he shall administer such lands as a part of the lakeshore after

publishing notice to that effect in the Federal Register.

Sec. 20 (a) The Indiana Dunes National Lakeshore is hereby dedicated to the memory of Paul H. Douglas in grateful recognition of his leadership in the effort to protect, preserve, and enhance the natural, scientific, historic, and recreational value of the lakeshore for the use, enjoyment, and edification of present and future generations.

(b) To further accomplish the purposes of subsection (a) of this section, the Secretary of the Interior shall designate the west unit of the lakeshore as the "Paul H. Douglas Ecological and Recreational Unit" and shall, subject to appropriations being granted, design and construct a suitable structure or designate an existing structure within the lakeshore to be known as the "Paul H. Douglas Center for Environmental Education" which shall provide facilities designed primarily to familiarize students and other visitors with, among other things: (1) the natural history of the lakeshore and its association with the natural history of the Great Lakes region; (2) the evolution of human activities in the area; and (3) the historical features which led to the establishment of the lakeshore by the Congress of the United States.

(c) To inform the public of the contributions of Paul H. Douglas to the creation of the lakeshore, the Secretary of the Interior shall provide such signs, markers, maps, interpretive materials, literature, and programs as he deems appropriate.

Sec. 21. (a) The Secretary in consultation with the Secretary of Transportation, shall conduct a study of various modes of public access into and within the lakeshore which are consistent with the preservation of the lakeshore and conservation of energy by encouraging the use of transportation modes other than personal motor vehicles.

(b) In carrying out the study, the Secretary shall utilize to the greatest extent practicable the resources and facilities of the organizations designated as clearinghouses under title IV of the Intergovernmental Cooperation Act of 1968 as implemented by Office of Management and Budget Circular A-95, and which have comprehensive planning responsibilities in the regions where the lakeshore is located, as well as any other agencies or organizations which the Secretary may designate. The Secretary shall make provision for timely and substantive consultations with the appropriate agencies of the States of Indiana and Illinois, local elected officials, and the general public in the formulation and implementation of the study.

(c) The study shall address the adequacy of access facilities for members of the public who desire to visit and enjoy the lakeshore. Consideration shall be given to alternatives for alleviating the dependence on automobile transportation. The study of public transportation facilities shall cover the distance from cities of thirty-five thousand population or more within fifty miles of the lakeshore.

(d) The study shall include proposals deemed necessary to assure equitable visitor access and public enjoyment by all segments of the population, including those who are physically or economically disadvantaged. It shall provide for retention of the natural, scenic, and historic values for which the lakeshore was established, and shall propose plans and alternatives for the protection and maintenance of these values as they relate to transportation improvements.

(e) The study shall examine proposals for the renovation and preservation of a portion of the existing South Shore Railroad passenger car fleet. The study shall consider the historic value of the existing rolling stock and its role in transporting visitors into and within the lakeshore.

(f) The study shall present alternative plans to improve, construct, and extend access roads, public transportation, and bicycle and pedestrian trails. It shall include cost estimates of all plans considered in this study, and shall discuss existing and proposed sources of funding for the implementation of the recommended plan alternatives.

(g) The study shall be completed and presented to the Congress within two complete fiscal years from the effective date of this provision.

(h) Effective October 1, 1981, there is hereby authorized to be appropriated not to exceed

$200,000 for this study.

Sec. 22. In exercising his authority to acquire property under this act, the Secretary shall give prompt and careful consideration to any offer made by an individual owning property within the lakeshore to sell such property, if such individual notifies the Secretary in writing that the continued ownership of such property is causing, or would result in, undue hardship.

Sec. 23. (a) The Secretary may acquire only such interest in that portion of area VII-A which is described in subsection (b) as the Secretary determines is necessary to assure public access over said portion of area VII-A.

(b) The portion of area VII-A, as designated on the map referred to in section 1, to which subsection (a) applies is a parcel of land bounded; (1) on the east by a line three hundred feet east of the electrical transmission line crossing area VII-A on January 1, 1979; (2) on the west by a line fifty feet west of such electrical transmission line; and (3) on the north and south by the northern and southern boundaries, respectively, of area VII-A.

(c) Area VII-A includes the bed of the railroad tracks forming the northern and northwestern boundaries of this area and extends to the northern edge of the bed of the railroad tracks forming the southern boundaries of this area. (d) Area I-D includes the bed of the railroad tracks along the northern boundary of this area.

(e) The area designated as area VII-C on the map referred to in section 1 does not include approximately 1.3 acres of land on which the Linde Air Products plant is situated, nor does it include approximately 1 acre of land on which the Old Union Station building and the adjacent REA building are situated. Except as provided in the foregoing sentence, area VII-C extends to, but does not include, the beds of the railroad tracks forming the northern and southern boundaries of such area.

Sec. 24. (a) The Secretary may enter into a cooperative agreement with the Little Calumet River Basin Development Commission, State of Indiana or any political subdivision thereof for the planning, management, and interpretation of recreational facilities on the tract within the boundaries of Indiana Dunes National Lakeshore identified as tract numbered 09-117 or on lands under the jurisdiction of the State of Indiana or political subdivision thereof along the Little Calumet River and Burns Waterway. The cooperative agreement may include provision for the planning of public facilities for boating, canoeing, fishing, hiking, bicycling, and other compatible recreational activities. Any recreational developments on lands under the jurisdiction of the National Park Service planned pursuant to this cooperative agreement shall be in a manner consistent with the purposes of this Act, including section 6(b).

(b) The Secretary shall conduct a study regarding the options available for linking the portions of the lakeshore which are divided by the Little Calumet River and Burns/Portage Waterway so as to coordinate the management and recreational use of the lakeshore. The Secretary shall submit the results of the study to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate within two years after the enactment of this section. Effective October 1, 1986, there is authorized to be appropriated such sums as may be necessary for the purposes of conducting this study.

Sec. 25. In furtherance of the purposes of this Act, the Secretary may enter into a cooperative agreement with the city of Gary, Indiana, pursuant to which the Secretary may provide technical assistance in interpretation, planning, and resource management for programs and developments in the city of Gary's Marquette Park and Lake Street Beach.

Sec. 26. (a) Before acquiring lands or interests in lands in Unit VII-D (as designated on the map described in the first section of this Act) the Secretary shall consult with the Commissioner of the Indiana Department of Transportation to determine what lands or interests in lands are required by

the State of Indiana for improvements to 15th Avenue (including the extension known as Old Hobart Road) and reconstruction and relocation of the intersection of 15th Avenue and State Road 51 so that the acquisition by the Secretary of lands or interests in lands in Unit VII-D will not interfere with planned improvements to the interchange and 15th Avenue in the area.

(b) Before acquiring lands or interests in lands in Unit I-M (as designated on the map referred to in the first section of this Act) the Secretary shall consult with the Commissioner of the Indiana Department of Transportation to determine what lands or interests in lands are required by the State of Indiana for improvements to State Road 49 and reconstruction and relocation of the interchange with State Road 49 and U.S. 20 so that the acquisition by the Secretary of lands or interests in lands in Unit I-M will not interfere with planned improvements to such interchange and State Road 49 in the area.

Sec. 27. In order to commemorate the vision, dedication, and work of Dorothy Buell in saving the Indiana Dunes, the National Park Service visitor center at the Indiana Dunes National Lakeshore is designated as the "Dorothy Buell Memorial Visitor Center".

NOTE

This is a compilation of the act establishing Indiana Dunes National Lakeshore and four subsequent acts amending that original legislation.

P.L. 89-761, 89th Congress (11/05/66) (80 Stat 1309)
P.L. 94-549, 94th Congress (10/18/76) (90 Stat 2529)
P.L. 96-612, 96th Congress (12/28/80) (94 Stat 3575)
P.L. 99-583, 99th Congress (10/29/86) (100 Stat 3318)
P.L. 102-430, 102st Congress (10/23/92) (106 Stat 2208)

APPENDIX B: AGENCY COORDINATION

NATIONAL PARK SERVICE TO INDIANA STATE HISTORIC PRESERVATION OFFICER (SHPO).
REQUEST FOR COMMENTS ON DEVELOPMENT OF THE SHORELINE RESTORATION MANAGEMENT PLAN.
DATED APRIL 25, 2011

INDIANA SHPO RESPONSE TO REQUEST FOR COMMENTS.
DATED MAY 23, 2011

NATIONAL PARK SERVICE TO NATIVE AMERICAN TRIBES.
REQUEST TO PARTICIPATE IN CONSULTATION ON THE DEVELOPMENT OF
THE SHORELINE RESTORATION MANAGEMENT PLAN.
DATED FEBRUARY 24, 2011

FISH AND WILDLIFE SERVICE TO NATIONAL PARK SERVICE.
COMMENTS PROVIDED ON POSSIBLE IMPACTS OF FEDERALLY LISTED AND CANDIDATE SPECIES
AND DESIGNATED CRITICAL HABITATS WITHIN THE PROPOSED PROJECT AREA.
DATED AUGUST 8, 2011

MEMORANDUM OF UNDERSTANDING BETWEEN THE NATIONAL PARK SERVICE AND
THE US ARMY CORPS OF ENGINEERS.
DATED AUGUST 9, 2010

REQUEST FOR THE STATE OF INDIANA TO BE COOPERATING AGENCY AND
RESPONSE FROM THE STATE OF INDIANA.
DATED APRIL 21, 2011 AND MAY 24, 2011

REQUEST AND RESPONSE FOR INDIANA DEPARTMENT OF NATURAL RESOURCES
TO BE COOPERATING AGENCY.
DATED JUNE 3, 2011

United States Department of the Interior

NATIONAL PARK SERVICE
Indiana Dunes National Lakeshore
1100 N. Mineral Springs Road
Porter, Indiana 46304-1299

IN REPLY REFER TO:

April 25, 2011

H4217(INDU)

Mr. Robert E. Carter, Jr.
State Historic Preservation Officer
Indiana Department of Natural Resources
Division of Historic Preservation & Archeology
402 West Washington Street, W274
Indianapolis, Indiana 46204

Dear Mr. Carter:

The National Park Service (NPS) would like to initiate consultation with your office on the development of the Shoreline Restoration and Management Plan for Indiana Dunes National Lakeshore at this time. Please note, Mr. Steve Davis, Indiana Department of Natural Resources (DNR) Division of Water, and Mr. Mike Molnar, with the DNR's Coastal Zone Management Program, are participating in the development of this plan.

The development and installation of navigational harbors and shoreline stabilization structures (jetties, breakwaters, revetments, and bulkheads) has altered southern Lake Michigan's natural east to west littoral drift. This has resulted in the significant accretion of sands to the east (up drift) of the Michigan City and Burns International harbors, and the subsequent sand starvation to the west (down drift) of these harbors. The lack of continued sand replenishment from natural littoral drift has further resulted in extensive beach and dune erosion threatening both public and private resources. The project area includes areas off-shore, the shoreline, and within the foredunes.

The public scoping information, including handout and presentation, is available on the NPS Planning, Environmental and Public Comment (PEPC) website at http://parkplanning.nps.gov for your review, and we have enclosed a copy of the public scoping brochure. We are in the process of developing project alternatives, and a newsletter of our progress will be distributed to all interested parties within the next few months. We hope to have the draft EA developed by late fall.

If you have any questions, please feel free to call Ms. Brenda Waters, Assistant Chief, Natural Resource Management, at 219-395-1552 or email her at brenda_waters@nps.gov, or you may contact Ms. Judith Collins, Historical Architect, at 219-395-1986 or email her at judith_collins@nps.gov.

Mitchell E. Daniels, Jr., Governor
Robert E. Carter, Jr., Director

DNR Indiana Department of Natural Resources

Division of Historic Preservation & Archaeology • 402 W. Washington Street, W274 · Indianapolis, IN 46204-2739
Phone 317-232-1646 • Fax 317-232-0693 · dhpa@dnr.IN.gov

May 23, 2011

Constantine J. Dillon
Superintendent
Indiana Dunes National Lakeshore
1100 N. Mineral Springs Road
Porter, Indiana 46304-1299

Federal Agency: National Park Service

Re: Request for comments regarding the development of the Shoreline Restoration and Management Plan for Indiana Dunes National Lakeshore (DHPA #11613)

Dear Mr. Dillon:

Pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f) and 36 C.F.R. Part 800, the staff of the Indiana State Historic Preservation Officer ("Indiana SHPO") has conducted an analysis of the materials dated April 25, 2011 and received on April 28, 2011 for the above indicated project in Indiana Dunes National Lakeshore; Lake, LaPorte, and Porter counties, Indiana.

Thank you for your recent notice regarding the development of the Shoreline Restoration and Management Plan for Indiana Dunes National Lakeshore. We have no specific comments at this time, but we look forward to receiving additional information about the project as it becomes available.

A copy of the revised 36 C.F.R. Part 800 that went into effect on August 5, 2004 may be found on the Internet at www.achp.gov for your reference. If you have questions about archaeological issues please contact Amy Johnson at (317) 232-6982 or ajohnson@dnr.IN.gov. If you have questions about buildings or structures please contact Chad Slider at (317) 234-5366 or cslider@dnr.IN.gov. Additionally, in all future correspondence regarding the above indicated project, please refer to DHPA #11613.

Very truly yours,

James A. Glass, Ph.D.
Deputy State Historic Preservation Officer

JAG:CWS:cws

emc: Brenda Waters, Assistant Chief, Natural Resource Management, Indiana Dunes National Lakeshore
Judith Collins, Historical Architect, Indiana Dunes National Lakeshore

United States Department of the Interior

NATIONAL PARK SERVICE
Indiana Dunes National Lakeshore
1100 N. Mineral Springs Road
Porter, Indiana 46304-1299

IN REPLY REFER TO:

February 24, 2011

H4217(INDU)

Miami Nation of Indians of the State of Indiana
Mr. Brian J. Buchanan, Chief
P.O. Box 41
80 W. 6th Street
Peru, Indiana 46970

Dear Mr. Buchanan:

The National Park Service (NPS) would like to invite you, as a stakeholder, to participate in consultation on the development of the Shoreline Restoration and Management Plan for Indiana Dunes National Lakeshore.

The development and installation of navigational harbors and shoreline stabilization structures (jetties, breakwaters, revetments, and bulkheads) has altered southern Lake Michigan's natural east to west littoral drift. This has resulted in the significant accretion of sands to the east (up drift) of the Michigan City and Burns International harbors, and the subsequent sand starvation to the west (down drift) of these harbors. The lack of continued sand replenishment from natural littoral drift has further resulted in extensive beach and dune erosion threatening both public and private resources. The project area includes areas off-shore, the shoreline, and within the foredunes.

The public scoping information, including handout and presentation, is available on the NPS Planning, Environmental and Public Comment (PEPC) website at http://parkplanning.nps.gov for your review, and we have enclosed a copy of the public scoping brochure. If you have any questions, please feel free to call Ms. Brenda Waters at 219-395-1552 or email her at brenda_waters@nps.gov. Any comments you have should be mailed to:

Constantine J. Dillon, Superintendent
Attention: Brenda Waters, Assistant Chief, Natural Resource Management
Indiana Dunes National Lakeshore
1100 North Mineral Springs Road
Porter, Indiana 46304-1299

Thank you for your participation in the development of the Shoreline Restoration and Management Plan.

Sincerely,

Constantine J. Dillon
Superintendent

Miami Tribe of Oklahoma
Mr. Thomas E. Gamble, Chief
Post Office Box 1326
Miami, OK 74355

Citizen Potawatomi Nation
Mr. John A. Barrett, Chairman of Citizen Potawatomi Nation
1601 South Gordon Cooper Drive
Shawnee, Oklahoma 74801

Forest County Potawatomi
Mr. Harold Frank, Chairman
P.O. Box 340
5416 Everybody's Road
Crandon, Wisconsin 54520

Match-e-be-nash-she-wish Band of Potawatomi Indians
Mr. David Sprague, Chairperson
Box 218
Dorr, Michigan 49323

Nottawaseppi Huron Band of Potawatomi Indians
Mr. Homer A. Mandoka, Tribal Council Chairperson
2221-1 1/2 mile Road
Fulton, Michigan 49052

Pokagon Band of Potawatomi Indians
Mr. Matthew Wesaw, Tribal Chairman
P.O. Box 180
58620 Sink Road
Dowagiac, Michigan 49047

Prairie Band of Potawatomi Nation
Mr. Steve Ortiz, Chairman
16281 Q Road
Mayetta, Kansas 66509

Hannahville Indian Community of Wisconsin Potawatomi Indians of Michigan
Hannahville Indian Community Council
Mr. Kenneth Meshigaud, Tribal Chairperson
N14911 Hannahville B-1 Road
Wilson, Michigan 49896-9728

Not Federally Recognized
Miami Nation of Indians of the State of Indiana
Mr. Brian J. Buchanan, Chief and Mr. John Dunnagan, Vice Chief
P.O. Box 41
80 W. 6th Street
Peru, Indiana 46970

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

August 8, 2011

Mr. Constantine J. Dillon
Superintendent
Indiana Dunes National Lakeshore
1100 North Mineral Springs Road
Porter, Indiana 46304

Dear Mr. Dillon:

The U.S. Fish and Wildlife Service has reviewed the Indiana Dunes National Lakeshore's (INDU) Preliminary Draft Shoreline Restoration and Management Plan and Environmental Impact Statement, dated July 2011. We have been asked to provide comments on the possible impacts of this Plan on Federally listed and candidate species and designated critical habitats within the proposed project area, which encompasses the southern shoreline of Lake Michigan between Michigan City, LaPorte County, on the east and the US Steel breakwater in Gary, Lake County, on the west. The entire Porter County shoreline of Lake Michigan is included.

The proposed project is within the range of the following Federally endangered, threatened, and candidate species:

Species	Location	Habitat
Indiana bat (Myotis sodalis) Endangered	All 3 counties	summer: forested areas typically associated with water resources; roost in trees with exfoliating bark
Karner blue butterfly (Lycaeides melissa samuelis) Endangered	Lake and Porter Counties	pine barrens and oak savanna with sandy soils and containing wild lupine
Mitchell's satyr	LaPorte County	prairie fens
Pitcher's (dune) thistle (Cirsium pitcheri) Threatened	Lake and Porter Counties	Great Lakes shoreline – stabilized dunes and blowout areas

Mead's milkweed (Asclepias medii) Threatened	Lake County	prairies
Eastern massasauga rattlesnake (Sistrurus catenatus catenatus) Candidate	LaPorte and Porter Counties	wetlands and adjacent uplands

The project study area also includes 9.7 kilometers (32,000 feet) of designated critical habitat for the endangered piping plover (Charadrius melodus) between the INDU/NIPSCO property line within the Dune Acres/Cowles Bog Unit and Kemil Road/East State Park Boundary Road at Beverly Shores, all in Porter County.

Neither the Mitchell's satyr nor the Mead's milkweed are found at INDU and therefore are not considered in the document. The eastern massasauga is found within suitable habitats at INDU inland from the project study area and is not present within the areas which will be affected by the proposed project.

The Indiana bat has been found at the Heron Rookery Unit of INDU but not within any of the habitats which will be affected by the shoreline project. Karner blue butterflies are present within several savanna complexes west of Burns Waterway and within Howes Prairie east of Burns Waterway. The project study area includes the former sand mines at West Beach where this species is found, but their habitat would not be affected by any of the activities proposed by this project.

Pitcher's thistle is present within dunes and blowouts landward of the beach within the Miller Woods, West Beach, Burns Ditch/Portage Lakefront Park, Dunes Acres/Howes Prairie, and Dune Ridge units of INDU, and within Big Blowout and nearby foredunes at Indiana Dunes State Park. The species was once present at Mt. Baldy but has not been observed since 1978, according to the Indiana Heritage Database. It is anticipated that the beach nourishment projects recommended by the project study will ultimately benefit this species through the increase of available sand and the restoration of dune formation processes, including the re-formation of foredunes where they have been eroded away. At some time in the future it may be possible to re-establish populations of Pitcher's thistle on various foredunes and at Mt. Baldy.

Piping plover currently do not nest within their designated critical habitat or elsewhere in Indiana but they are regularly observed during both spring and fall migration, often at Miller Beach in Gary but also at Washington Park Beach in Michigan City; in 2010 several migrating piping plover were observed along the beach within the Indiana Dunes State Park, which is part of the critical habitat. The sand accretion area east of the Port of Indiana Industrial Complex breakwalls, which is both the current and the proposed site of dredged sand for beach nourishment at the Portage Lakefront Park, is affecting the critical habitat by expanding the width of the beach. Based upon information currently available to us, we do not believe that the

preferred alternative for removal of sand from this site, which is to dredge 370,000 cubic yards of material every five years and move it to the Portage Lakefront Park, would adversely modify this critical habitat. However, it may be necessary to further study the possible impacts of this dredging as project plans are finalized and the exact dredging location is determined.

Therefore, we concur with your determination that the proposed project may affect but is not likely to adversely affect these endangered, threatened, and candidate species or adversely modify piping plover critical habitat.

This precludes the need for further consultation on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. If, however, new information on endangered species at the site becomes available or if project plans are changed significantly, please contact our office for further consultation.

Thank you for this opportunity to provide comments on this proposed project. If you have any questions, please contact Elizabeth McCloskey at (219) 983-9753 or elizabeth_mccloskey@fws.gov.

Sincerely yours,

Elizabeth L. McCloskey acting for

Scott E. Pruitt
Supervisor

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
111 NORTH CANAL STREET
CHICAGO IL 60606-7206

REPLY TO
ATTENTION OF

August 9, 2010

Office of Counsel

Brenda Waters
Assistant Chief of Natural Resources
Indiana Dunes National Lakeshore
1100 N. Mineral Springs Road
Porter, IN 46304

RE: Memorandum of Understanding (MOU) between the National Park Service and the U.S. Army Corps of Engineers

Dear Ms. Waters:

Please find enclosed for your further action an MOU for the Indiana Dunes National Lakeshore Shoreline Restoration and Management Plan Environmental Impact Statement, including two signature sheets partially executed by the U.S. Army Corps of Engineers.

If you have any questions, please contact me at (312) 846-5353 or by email at michaele.j.mandulak@usace.army.mil.

Sincerely,

Michaele Mandulak

Michaele Mandulak
Assistant District Counsel
Chicago District, U.S. Army Corps of Engineers

Enclosure

MEMORANDUM OF UNDERSTANDING BETWEEN THE NATIONAL PARK SERVICE AND THE U.S. ARMY CORPS OF ENGINEERS FOR INDIANA DUNES NATIONAL LAKESHORE SHORELINE RESTORATION AND MANAGEMENT PLAN ENVIRONMENTAL IMPACT STATEMENT

This Memorandum of Understanding (MOU) is entered into by the National Park Service (NPS) and the U.S. Army Corps of Engineers, Chicago District (USACE).

I. PURPOSE

The purpose of this MOU is to effectuate the commitment of the USACE and the NPS to work together cooperatively in the preparation of the Environmental Impact Statement for the Indiana Dunes National Lakeshore Shoreline Restoration and Management Plan, as envisioned by the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., and Council on Environmental Quality (CEQ) regulations implementing NEPA, 40 C.F.R. Parts 1500-1508.

II. BACKGROUND

The NPS is initiating the development of a Shoreline Restoration and Management Plan (Plan) and Environmental Impact Statement (EIS) for Indiana Dunes National Lakeshore. This Plan and EIS are funded by the Great Lakes Restoration Initiative (GLRI), an Environmental Protection Agency-led, interagency Great Lakes restoration initiative which will target the most significant problems in the Great Lakes region, including invasive aquatic species, non-point source pollution, and contaminated sediment, in order to protect, maintain, and restore the chemical, biological, and physical integrity of the Great Lakes.

The Plan and EIS are needed to restore and effectively manage approximately thirteen miles of the southern Lake Michigan shoreline at Indiana Dunes National Lakeshore. These documents will evaluate and select options for: 1) restoring or replicating natural sediment processes updrift of and within the park; 2) restoring and managing foredunes, controlling and preventing invasive nonnative plants, and protecting federally-listed threatened and endangered species in the park; 3) reducing potential nonnative invasive threats to the lakeshore such as Cladophora, round goby, and salmonella; 4) improving water quality; 5) ensuring appropriate visitor access and use; and 6) coordinating beach management and access with landowners and partners including a state park, three counties, five cities, ten townships, non-government organizations, private industry and landowners, and concerned citizens.

The Plan and EIS will: (1) examine the impacts of structures and activities along the Lake Michigan shoreline near and within the park, (2) determine the responsibility for

mitigating such impacts, (3) develop a reasonable range of alternatives that would mitigate such impacts consistent with park resource management objectives, and (4) select one or several such alternative(s).

The involvement of the USACE in this effort will be critical to ensure that the EIS is technically adequate and legally defensible. USACE has regulatory jurisdiction over "waters of the United States" and possesses relevant analysis, data, and other technical information which the NPS will utilize for comparison of alternatives in the EIS and for decision-making. In addition, since it is likely that one or more of the alternatives in the EIS will involve USACE action, USACE involvement is important to ensure that the description and analysis of such alternatives is not inconsistent with USACE mandates.

Following the completion of the Plan and EIS, the NPS intends to implement the selected alternative(s) or work with other Federal and state agencies and other stakeholders to encourage and facilitate their implementation of the selected alternative(s).

III. STATUTORY AND REGULATORY AUTHORITIES

This MOU is entered into under the authority of NEPA, 42 U.S.C. § 4321 et seq.; CEQ regulations implementing NEPA, 40 C.F.R. Parts 1500-1508; Department of the Interior NEPA regulations at 43 C.F.R. Part 46; and USACE NEPA regulations at 33 C.F.R. Part 230. Pursuant to NEPA, the Federal government shall use all practicable means to improve and coordinate Federal plans, functions, programs, and resources to enhance the quality of the environment.

CEQ regulations at 40 C.F.R. § 1501.6 emphasize interagency cooperation early in the environmental review process; and at 40 C.F.R. § 1501.5 provide for the designation in writing of a lead agency that will supervise the preparation of an environmental impact statement and for the identification of cooperating agencies which have jurisdiction by law and/or special environmental expertise, if more than one Federal agency is involved in the same action, such as actions affecting the shoreline at Indiana Dunes National Lakeshore.

The NPS is authorized by the NPS Organic Act, 16 U.S.C. § 1 et seq., and its implementing regulations to conserve the resources of all units of the National Park System, including Indiana Dunes National Lakeshore, unimpaired for the enjoyment of current and future generations, and is further authorized by the Indiana Dunes National Lakeshore enabling statute, 16 U.S.C. § 460u through § 460u-13, to specifically preserve for the educational, inspirational, and recreational use of the public certain portions of the Indiana dunes and other areas of scenic, scientific, and historic interest and recreational value in the State of Indiana.

The Indiana Dunes National Lakeshore includes approximately 542 acres of submerged land and water area extending 300 feet into Lake Michigan from the south shore of the lake. The USACE is responsible for issuing Department of the Army Permits under Section 10 of the Rivers and Harbors Act approved March 3, 1899 (33 U.S.C. §403) and

its implementing regulations for work in navigable waters affecting the course, location, condition, or capacity of such waters; and under Section 404 of the Clean Water Act (33 U.S.C. §1344) and its implementing regulations for the discharge of dredged or fill material into waters of the United States.

USACE has an authorized project—Indiana Shoreline Erosion, IN—for shoreline erosion protection at Indiana Dunes National Lakeshore that is authorized by Section 501(a) of the Water Resources Development Act of 1986 (P.L. 99-662), as amended by Section 4(g) of the Water Resources Development Act of 1988 (P.L. 100-676). USACE is further authorized by Section 204 of the Water Resources Development Act of 1992, as amended (33 U.S.C. 2326) to develop and implement regional sediment management plans.

IV. COMMITMENT OF THE PARTIES

A. In the spirit of cooperation and collaboration, and with the mutual understanding that this is a flexible working agreement among the signatory agencies, the NPS and USACE hereby commit to the following responsibilities:

1. The NPS will serve as the lead agency for the EIS for Indiana Dunes National Lakeshore Shoreline Restoration and Management Plan;

2. The USACE will serve as a cooperating agency for the EIS for Indiana Dunes National Lakeshore Shoreline Restoration and Management Plan.

B. As lead agency, the NPS agrees to:

1. Provide USACE with project information in a timely and thorough manner;

2. Seek input from USACE on the preferred and environmentally preferred alternatives in the EIS;

3. Invite USACE to project meetings;

4. Provide USACE an opportunity to comment on draft documents;

5. Provide USACE with an opportunity to participate in the NPS consultations with other agencies and organizations, including the U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service, the Indiana Department of Environmental Management, Indiana Department of Natural Resources, local cities, towns and county governments and other non-government groups such as the Northwestern Indiana Regional Planning Commission, and The Nature Conservancy;

6. Provide USACE with an opportunity to participate in the public involvement in this project from initial scoping through the entire process, including the preparation of

project newsletters at appropriate stages of the project, the establishment of a planning website for the project, and the implementation of public meetings; and

7. Provide USACE with an opportunity to participate in the consultation with tribal nations on a separate nation-to-nation track.

C. As cooperating agency, USACE agrees to:

1. Participate in the scoping process, meetings, consultation, and document review and editing process;

2. Provide the NPS, in a timely manner, with all reasonably available USACE data and analysis relevant to the EIS;

3. Provide assistance to the NPS in areas of USACE special technical expertise and legal jurisdiction, in a timely manner, with regard to the analysis, alternatives, and conclusions in the EIS;

4. Provide input to the NPS on the preferred and environmentally preferred alternatives in the EIS; and

5. Provide the NPS, in a timely manner, with comments on draft documents and otherwise fulfill the role of a cooperating agency as set forth at 40 C.F.R. Part 1501.6.

D. Both NPS and USACE agree to:

1. Consider both agencies' legal authorities, obligations, and constraints, including their jurisdictional and regulatory mandates, in the evaluation of the proposed alternatives;

2. Recognize that, pursuant to GLRI deadlines, the Plan and EIS must be completed by September 30, 2011, and accordingly expedite evaluation of the effects of the proposed alternatives in the EIS;

3. Identify opportunities for efficiency and collaboration in the development of the EIS;

4. Designate a point of contact for the development, review, and completion of the EIS; and

5. Make staff available, subject to available resources, to perform the responsibilities set forth in paragraphs IV.B and IV.C. and ensure that the EIS is completed by the GLRI deadline.

V. MISCELLANEOUS PROVISIONS

A. NPS and USACE will, as needed, enter into specific reimbursable agreements pursuant to the Economy Act, 31 U.S.C. § 1535, and in accordance with 40 C.F.R. 1501.6 (b)(5) when one party is to furnish materials or perform work or provide a service on behalf of another party.

B. NPS and USACE shall retain all applicable legal responsibility for their respective personnel working pursuant to this MOU. The MOU is not intended to change in any way the individual employee status or the liability or responsibility of any party under Federal law.

C. Nothing in this MOU is intended to conflict with current law, regulation, directive, or other governing authority of any party to this MOU. If any term of this MOU is inconsistent with such authority, then that term shall not apply, but the remaining terms and conditions of the MOU shall remain in full force and effect.

D. This document is an intra-governmental agreement between NPS and USACE intended to facilitate cooperation between NPS and USACE in the preparation of an EIS and does not create or confer any rights, privileges, or benefits upon any person or entity not a signatory hereto. This MOU is not and shall not be construed as a rule or regulation.

E. All provisions of this document are subject to the availability of funds.

VI. MODIFICATION, TERMINATION, AND TERM OF AGREEMENT

A. This MOU becomes effective upon the date of signature by the last signatory.

B. This MOU may be modified or amended in writing upon the mutual consent of the NPS and USACE, and other affected Federal or State agencies may seek to become a party to this MOU.

C. Either party to this MOU may terminate its participation in this MOU upon written notice to the other party.

D. This MOU shall terminate upon the completion of NPS's Record of Decision for the EIS, unless prior thereto it is relinquished, abandoned, or otherwise terminated pursuant to the provisions of this MOU.

VII. KEY OFFICIALS

The U.S. Army Engineer, Chicago District and Superintendent of Indiana Dunes National Lakeshore or their delegates shall direct the operations and measures agreed to in this instrument.

VIII. AUTHORIZING SIGNATURES

IN WITNESS THEREOF, the parties to this agreement have signed their names and executed this Memorandum of Understanding.

USACE

Name: Vincent V. Quarles
Title: Colonel, U.S. Army
District Commander
Date: 06 AUG 2010
Address:
Department of the Army
Chicago District, Corps of Engineers
111 North Canal Street
Chicago, Illinois 60606-7206

National Park Service

Name: Constantine Dillon
Title: Superintendent

Date:
Address:
National Park Service
Indiana Dunes National Lakeshore
1100 North Mineral Springs Road
Porter, IN 46304-1299

"McAhron, Ron" <rmcahron@dnr.IN.gov>

05/24/2011 08:12 AM

To <Brenda_Waters@nps.gov>

cc <Bob_Daum@nps.gov>, <Charles_Morris@nps.gov>, "Davis, Steve" <sdavis@dnr.IN.gov>, "Molnar, Mike" <mmolnar@dnr.IN.gov>, <Erin_Flanagan@nps.gov>

Subject RE: Shoreline MOU

Brenda:

Sorry for the delayed response. I have been advised that our procedures strongly discourage IDNR from entering MOU's with agencies and entities outside state government. We are not opposed to Steve being involved in the project; in fact we believe he would be an asset. If you have a less formal vehicle to accomplish that end, we would be glad to work with you on that. I am thinking along the lines of a confidentiality agreement.

Ron McAhron
Deputy Director
IDNR
402 W. Washington St Rm 256
Indianapolis, IN 46204
Phone (317) 232-1557
Cell (317) 696-9307

-----Original Message-----
From: Brenda_Waters@nps.gov [mailto:Brenda_Waters@nps.gov]
Sent: Thursday, April 21, 2011 11:48 AM
To: McAhron, Ron
Cc: Bob_Daum@nps.gov; Charles_Morris@nps.gov; Davis, Steve; Molnar, Mike; Erin_Flanagan@nps.gov
Subject: Shoreline MOU

Dear Ron,

Thank you for calling me last week, it was good to get to speak with you about the shoreline plan and our draft MOU. Spring is a busy time of the year so I want to let you know I will be out of the office from April 22 to May 2. I don't want to slow down our progress while I am out. If you have the red-lined MOU for the Shoreline Plan ready while I am out of the office, could you please send it to Bob Daum and Charlie Morris? They will be able to move it forward. Their emails are bob_daum@nps.gov and charles_morris@nps.gov.

I appreciate your help and IDNR's continued participation by Steve Davis. His expertise in coastal processes continues to add value to our planning process.

Sincerely,
Brenda

****

Brenda Waters
Assistant Chief of Natural Resources
Indiana Dunes National Lakeshore
1100 N Mineral Springs Road
Porter, IN 46304
Office: (219) 395-1552
Fax: (219) 395-1588
****

Brenda Waters/INDU/NPS
06/03/2011 09:34 AM

To "McAhron, Ron" <rmcahron@dnr.IN.gov>
cc Bob_Daum@nps.gov, Charles_Morris@nps.gov, Erin_Flanagan@nps.gov, "Molnar, Mike" <mmolnar@dnr.IN.gov>, "Davis, Steve" <sdavis@dnr.IN.gov>, Nicholas Chevance/Omaha/NPS@NPS
bcc

Subject RE: Shoreline MOU

Ron,

Thank you for getting back to with the decision on the Shoreline MOU between NPS and IDNR. We appreciate the assistance and expertise that IDNR has provided through Steve Davis as we work to develop the Shoreline Plan/EIS. At this point in the planning process, it seems most appropriate for us to continue our with informal communication and cooperation. We look forward to your comments on the draft Plan/EIS. It is scheduled to be available for public review this winter.

Sincerely,
Brenda

****
Brenda Waters
Assistant Chief of Natural Resources
Indiana Dunes National Lakeshore
1100 N Mineral Springs Road
Porter, IN 46304
Office: (219) 395-1552
Fax: (219) 395-1588
****

APPENDIX C: TECHNICAL REFERENCES (PAGES 341 THROUGH 392)
IS AVAILABLE IN ELECTRONIC FORMAT AT

HTTP://PARKPLANNING.NPS.GOV/PROJECTHOME.CFM?PROJECTID=33151

APPENDIX C: TECHNICAL REFERENCES

(AVAILABLE ONLINE ONLY)

C1: WAVE CLIMATE AND LONGSHORE SEDIMENT TRANSPORT ANALYSIS
C2: LAKE MICHIGAN WAVAD HINDCAST — 1982 TO 2007
C3: 1951/1952 TO 2010 SHORELINE CHANGE ANALYSIS
C4: SUMMARY OF REGIONAL SHORELINE CHANGE ANALYSIS (1951/52 TO 2010)
C5: DETAILED SHORELINE CHANGE MEASUREMENTS

APPENDIX C1: WAVE CLIMATE AND LONGSHORE SEDIMENT TRANSPORT ANALYSIS

SITE

The Indiana Dunes National Lakeshore (INDL) is located at the southern end of Lake Michigan, with the coastal boundaries of the park defined by Michigan City Harbor in the northeast and Gary/USX Steel Harbor in the west. Refer to figure 1 for a location map. This is a highly modified coastal environment. It is also a landscape of contrast, featuring some of the most unique beaches and coastal dune habitat in North America, located in between large lakefill projects, ports and harbors.

This report describes our technical analysis performed for the lake levels and waves at the site, along with longshore sediment transport modeling. Based on this technical analysis, it also describes the implications for the shoreline change rates documented in a companion report (1951/1952 to 2010 Shoreline Change Analysis, Indiana Dunes National Lakeshore, Baird 2011). Collectively, this information was utilized to develop long-term potential Shoreline Restoration Plans for the INDL.

WATER LEVEL AND WAVE ANALYSIS

This section of the report describes the procedures undertaken in order to quantify the lake level conditions and wave climate at the project site. Together, the waves and water levels determine the design conditions used to establish the level of shore protection required. For example, the established conditions will be used to design "soft" erosion mitigation techniques, such as beach nourishment and "hard" structures, such as breakwaters or groins (emergent or submerged).

Typically, various conditions are analyzed to determine the wave climate at a site in the Great Lakes. The USACE utilizes a set of design conditions established using the (10:20 and (20:10) criteria. The (10:20) and (20:10) method is a combined return period criteria that uses both the 1:10 year water level with the 1:20 year wave height, and the 1:20 year water level with the 1:10 year wave height, respectively. Whichever combination results in a larger design wave at the structure governs as the design condition.

Coastal erosion protection structures around the Great Lakes typically use 25 to 50-year design life engineering calculations. It is important to recognize that this assumption is no guarantee that the coastal structure will actually last for 25 or 50 years. A storm event that exceeds the design conditions may occur in any given year.

FIGURE 1: LOCATION MAP FOR THE INDIANA DUNES NATIONAL LAKESHORE

It is also noted that with a regular monitoring program in place and maintenance repairs as needed, the coastal structures might be functional at the end of their 25 to 50-year design life. For the purposes of this conceptual design study, a 50-year design life was assumed for engineering structures.

The following section describes a risk assessment approach to establish an appropriate set of design conditions for the site.

Risk Assessment to Establish Design Conditions

Risk is defined as the probability that a given design event (e.g., a specified combination of monthly mean water level, storm surge and wave height) will be reached or exceeded at least once during the project life. If the design event is reached or exceeded, there will be certain consequences that must be taken into consideration. For example, there may be damage to the structure and the possibility of habitat loss and economic damages.

The level of acceptable risk should be defined and accepted by the project Owner during the first stages of a project with a firm understanding of the implications for different levels of risk. The International Navigation Association (PIANC 2003) provides basic guidance on the selection of appropriate risk levels for breakwater design; this approach has also been adopted by the International Organization for Standardization (ISO) in the Draft International Standard 21650. PIANC establishes four safety classes (very low, low, normal, and high), and evaluates them based upon potential risk of human injury, environmental and economic consequences. This information provides some insight on the level of acceptable risk for design purposes. table 1 summarizes maximum acceptable risk based on various "safety class" levels (PIANC 2003), along with examples provided in ISO/DIN 21650.

The safety class and desired limit state selected for this project were based on our review of the PIANC guidance and will require additional consultation with the National Park Service (NPS) in a final design phase. At this time, the appropriate safety class for potential shoreline protection structures is assumed to be "very

TABLE 1: MAXIMUM ACCEPTABLE RISK

Safety Class	Indicators	SLS*	ULS**	Examples (ISO/DIS 21650:2007)
Very Low	No risk to human injury Small environmental consequences Small economic consequences	40%	20%	Small coastal structures.
Low	No risk to human injury Some environmental consequences Some economic consequences	20%	10%	Larger coastal structures such as breakwaters in deep water and exposed seawalls protecting infrastructure.
Normal	Risk to human injury Significant environmental consequences High economic or political consequences	10%	5%	Breakwaters protecting a LNG-terminal or power station.
High	Risk to human injury Significant environmental consequences Very high economic or political consequences	5%	1%	Sea dyke protecting a populated low land.

Source: PIANC, 2003.

Notes:

*Serviceability Limit State (SLS): e.g., overtopping, settlement of foundation soil

**Ultimate Limit State (ULS): e.g., foundation failure, failure of significant portion of structure

low", and this relates to a condition where there is no direct risk of human injury and small environmental or economic consequences associated with the failure of the structure (i.e. impacts before it can be repaired). According to Serviceability Limit State (SLS), the acceptable maximum probability of failure during the lifetime of a structure of this description is 40% (PIANC 2003). These assumptions will have to be further discussed and verified with the NPS in a final design project phase.

Assuming a design life of 50-years and applying the standard formula (refer Equation 1) for calculating the risk of an event occurring, it was determined that the corresponding design return period event is 100 years.

EQUATION 1: RISK OF AN EVENT OCCURRING WITHIN A SPECIFIED DESIGN LIFE

$$Risk = 1 - \left(1 - \frac{1}{Tr}\right)^{DesignLife}$$

Lake Level and Storm Surge Analysis

Water levels on Lake Michigan vary both in the long-term in response to continental scale climatic conditions, as well as in the short term due to the passage of individual storm events, creating short duration storm surges. Storm surge is a local increase in the water level caused by wind stresses applied to the water surface and regional scale pressure gradients.

The computer model HYDSTAT was used to complete a joint probability analysis (JPA) for long term monthly mean lake levels and short term surge data. HYDSTAT is a well recognized model that has been used extensively around the Great Lakes for flood level and water related hazard studies (USACE 1988; OMNR 1989). Refer to Baird (2010) for additional information on the model and recent applications throughout the Great Lakes Basin.

To assess storm surge, 41 years of hourly measured water level data from the National Oceanic & Atmospheric Administration (NOAA) Calumet Harbor gage (9087044) on Lake Michigan were obtained for the period 1970-2010. A surge event was defined as any period of time where the lake level was greater than +0.8 ft above the still water level for more than 3 consecutive hours, with a minimum of 24 hours between successive events. From this population of events, the largest annual surge was selected for the 41 year period of record. These surge events were used for the first independent variable and extreme value analysis in HYDSTAT.

The lakewide monthly mean data for Lake Michigan was analyzed from 1954 to 2010 to establish an annual maximum monthly mean lake level. 1954 corresponded to the beginning of the temporal analysis in the 1988 USACE study. This annual maximum series of monthly mean lake levels was used as the second independent variable for the HYDSTAT analysis.

HYDSTAT was then used to perform a JPA on the two independent variables (still water level and storm surge) and select an appropriate probability distribution for the data. The Log Pearson 3 distribution was selected for the HYDSTAT output and used to establish the return period lake levels in table 2 on page 330. The lake levels are presented as an elevation relative to Vertical Datum IGLD85, and above Low Water Datum of 577.5 feet. For reference, table 2 also includes the extreme lake levels with a return period of 10, 50, 100 and 500, as published by the USACE 1988 study. It should be noted that this study relied on data from 1954 to 1986, which is a much shorter temporal duration than our present analysis (e.g., 24 years of additional information is now available). Since some of those years featured very high lake levels (e.g., 1998), the updated results in table 2 are approximately 0.7 ft higher than the levels reported in the 1988 USACE report.

The 1988 USACE report was updated in 1993 and the findings are summarized in a report entitled Design Water Level Determination on the Great Lakes (USACE, 1993). The reported 10-, 50-, and 100-Year lake level (still water with combined surge) values are 582.94, 583.41 and 584.34 feet IGLD85, respectively. Refer to table 2 for summarized information.

TABLE 2: RESULTS OF THE JOINT PROBABILITY ANALYSIS (SURGE AND MEAN LAKE LEVEL) FOR THE CALUMET GAGE

Return Period (years)	Lake Level (ft LWD)	Baird Lake Level (ft IGLD 85)	USACE 1988 (ft IGLD 85)	USACE 1993 (ft IGLD 85)
2	4.0	581.5	–	–
5	5.1	582.6	–	–
10	5.7	583.2	582.5	582.9
25	6.4	583.9	–	–
50	6.8	584.3	583.6	583.4
100	7.2	584.7	584.0	584.3
200	7.5	585.0	–	–
500	7.9	585.4	584.9	–

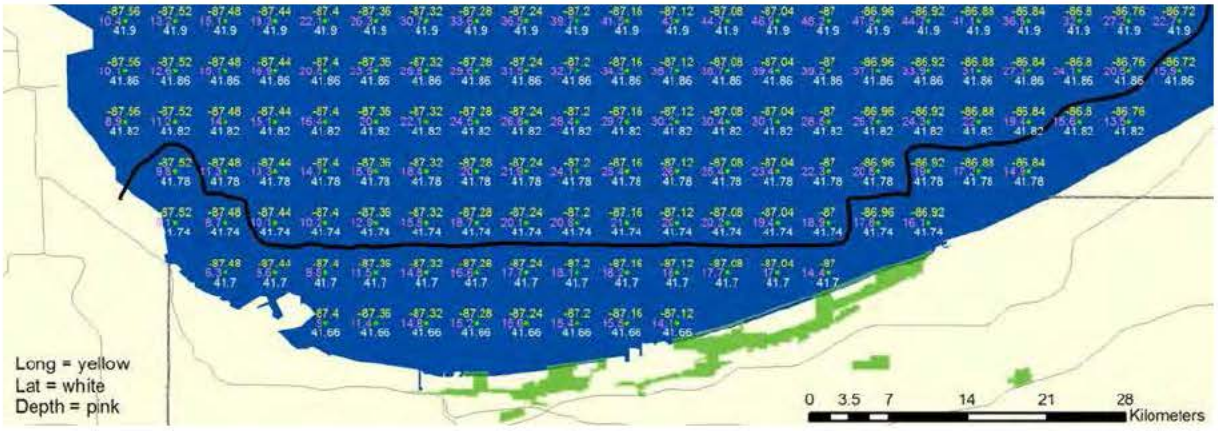
Notes:
ft = foot (feet)
USACE = U.S. Army Corps of Engineers

Wind-Wave Hindcast with the WAVAD Model

Wave data for the site was obtained from Baird's in-house Lake Michigan wave hindcast model at a point in the central portion of the study area (Lat 41.66, Long -87.12). Refer to figure 2, which identifies all the model output locations (modeling results considered) for the southern portion of Lake Michigan. The water depth at the selected point is 46 ft below CD. This data was transformed to a depth of 6 ft below CD, which is the anticipated depth for any potential engineering structures that might be considered. For reference, the nature of these potential structures had not been determined at the time the hindcast analysis was performed; therefore, it was assumed the structures could include submerged shoals (underwater stone berms) that enhance local beach conditions.

WAVAD was developed by the Engineering Research Development Center, Coastal Hydraulics Laboratory of the USACE (Resio and Perrie, 1989). The model simulates wave growth and propagation in deep water. For additional information on the WAVAD modeling and similar applications in the Great Lakes Basin, refer to the Baird summary presented after the references list.

FIGURE 2: WAVAD GRID POINTS FOR SOUTHERN LAKE MICHIGAN



At a reference water depth of 6 ft below CD for engineering structures, it was determined the waves are depth limited at the site using the lake levels presented in table 2 on page 330. In other words, the wave height is controlled by water depth. Consequently, the return period for the design event is directly related to the extreme water levels shown in table 3.

As outlined in the risk assessment, a 100 year event was recommended for designing engineering structures. This corresponds to a lake level of 7.2 ft above CD and a breaking wave height of 10.7 ft.

LONGSHORE SEDIMENT TRANSPORT MODELING

The results of the longshore sediment transport modeling completed for the study area are described in this section and build on the previous technical investigation completed by Baird (2004) at Michigan City.

Regional Sediment Modeling

The COSMOS 2-dimensional computer model was applied to calculate the Longshore Sediment Transport (LST) rates at 2 km (1.25 miles) intervals along the shoreline between New Buffalo and the Port of Indiana Industrial Complex over the 45-year period of 1956 to 2000. The beach profiles extended out to a depth of approximately 15 m (49 feet) below CD and were assumed to be covered with a sandy layer. A uniform sand grain size of 0.3 mm was used based on sediment samples collected during a previous site visit (Baird 2003).

Waves in the study area were transformed to a 15 m water depth at each calculation point using linear refraction and shoaling equations. The input wave data had a yearly scatter format and was split into North and West wave files (separated based on a shore perpendicular azimuth at each profile) to estimate contributions from each direction. The contributions will be referred to as southward and northward components, respectively, hereafter. Calculations were conducted at almost 30 different points along the shoreline.

Figure 3 on page 332 shows the 45-year average annual cross-shore distribution of LST for a typical beach profile. Sediment motion extends out to beyond 10 m (33 feet) below CD. The existence of two bars on the profile results in two peaks in the LST curves. The shallow depths over the bar induces wave breaking and results in larger depth average currents and near-bottom orbital velocities, leading to higher LST rates. There is also a third peak near the shoreline in the swash zone followed by a change in net transport direction from south to north. The northward transport is the cumulative effect of smaller waves that arrive mostly from the west, which is the dominate wind direction but features a smaller fetch compared to the north. Regional variations of LST are discussed in the following subsections.

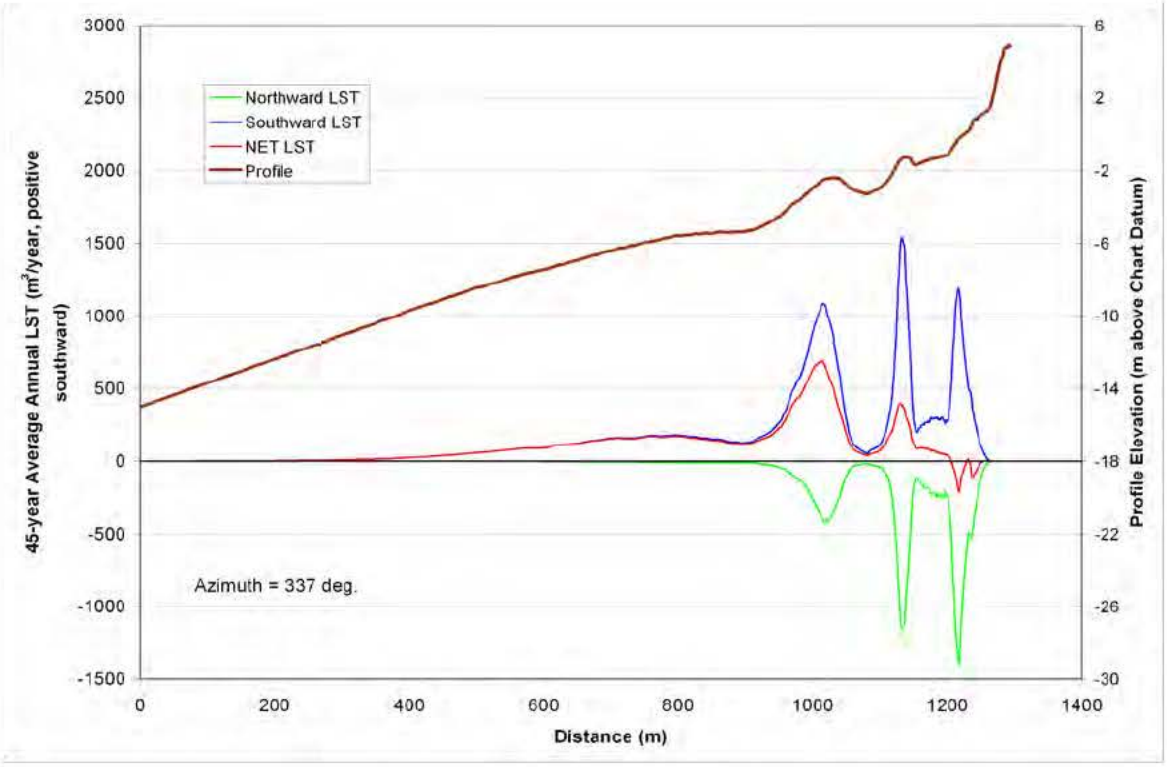
TABLE 3: RETURN PERIOD LAKE LEVELS AND WAVE HEIGHTS

Return Period (years)	Lake Level (ft LWD)	Total Water Depth (ft)	Depth Limited Wave Height (ft)
2	4.0	10.0	8.2
5	5.1	11.1	9.1
10	5.7	11.7	9.6
25	6.4	12.4	10.1
50	6.8	12.8	10.4
100	7.2	13.2	10.7

Notes:

ft = foot (feet)

FIGURE 3: CROSS-SHORE DISTRIBUTION OF LST FOR A TYPICAL BEACH PROFILE



LST for Pre-Harbor Shoreline

In order to understand the regional LST pattern prior to construction of the harbors and ports, COSMOS runs were completed for the shoreline and the shoreline orientation based on the 15 m contour taken from the 1874 historical survey. Calculated pre-harbor regional LST and its northward and southward components are shown in figure 4 on page 333. In this figure, distances are referenced to Michigan City Harbor which is located at 0 km. It may be seen that net LST decreases gradually from 250,000 m^3/year (327,000 yd^3/year) at New Buffalo to about

170,000 m^3/year (222,000 m^3/year) at the Port of Indiana Industrial Complex. These results suggest historically the shorelines between New Buffalo and the Industrial Complex were accreting. This long term trend of accretion also supports the lake level studies of Baedke and Thompson (2000), which document the formation of the Indiana Dunes at the southern end of Lake Michigan over the last 4,700 years.

LST Estimates for Existing Conditions

Calculated regional LST rates for the existing conditions between New Buffalo and the Port of Indiana Industrial Complex are shown in figure 5 on page 333. The calculated historic rates from the previous section are also shown in this figure for comparison. While the potential incoming and outgoing transport rates to the study area are the same as their historic rates, differences are noticed around the Michigan City Harbor. It may be seen that the formation of the updrift fillet and the resulting change in the shoreline orientation has resulted in a stronger negative LST gradient than the pre-harbor condition. This fact combined with the trapping potential of the harbor are the principal factors responsible for the creation and growth of the fillet beach. Immediately downdrift of Michigan City Harbor, a positive or increasing LST gradient extending to about 4 km downdrift is calculated. This positive LST gradient and the sediment budget deficit at Mount Baldy (Baird 2004) are responsible for the observed erosion in this area.

FIGURE 4: LST FOR PRE-SETTLEMENT SHORELINE ORIENTATION

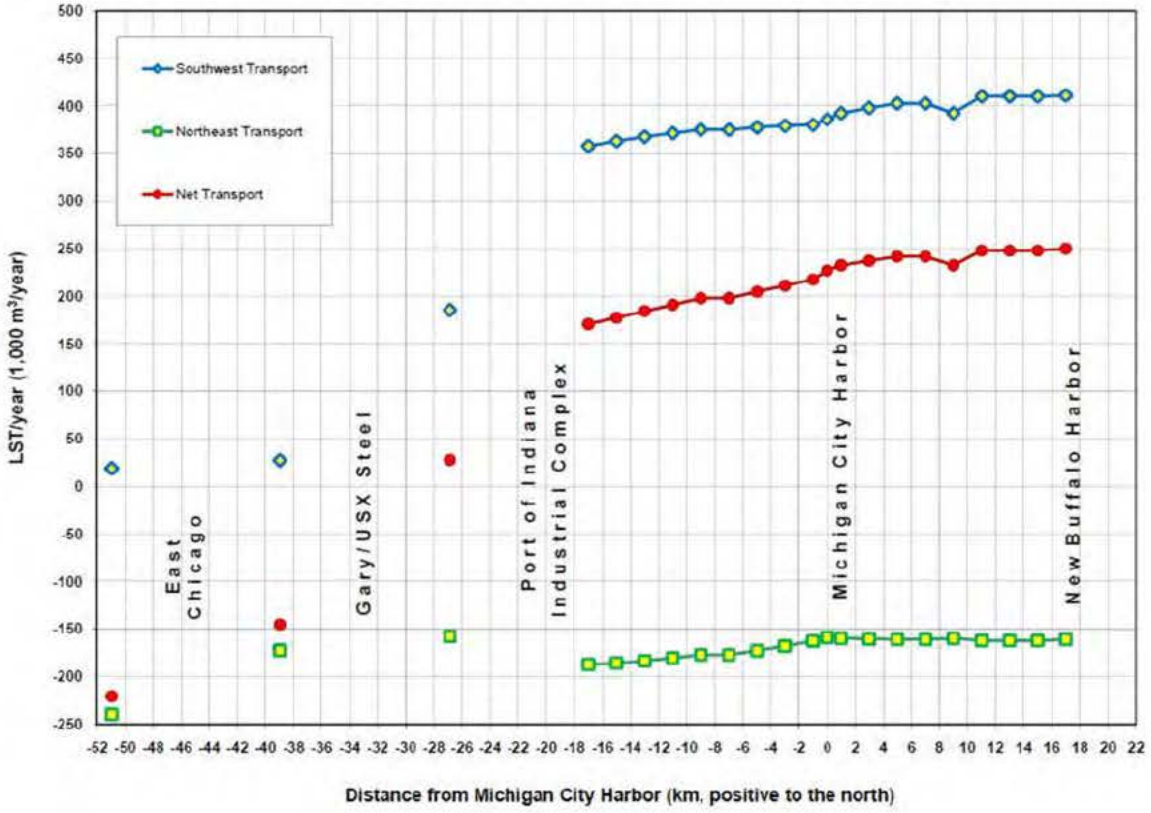
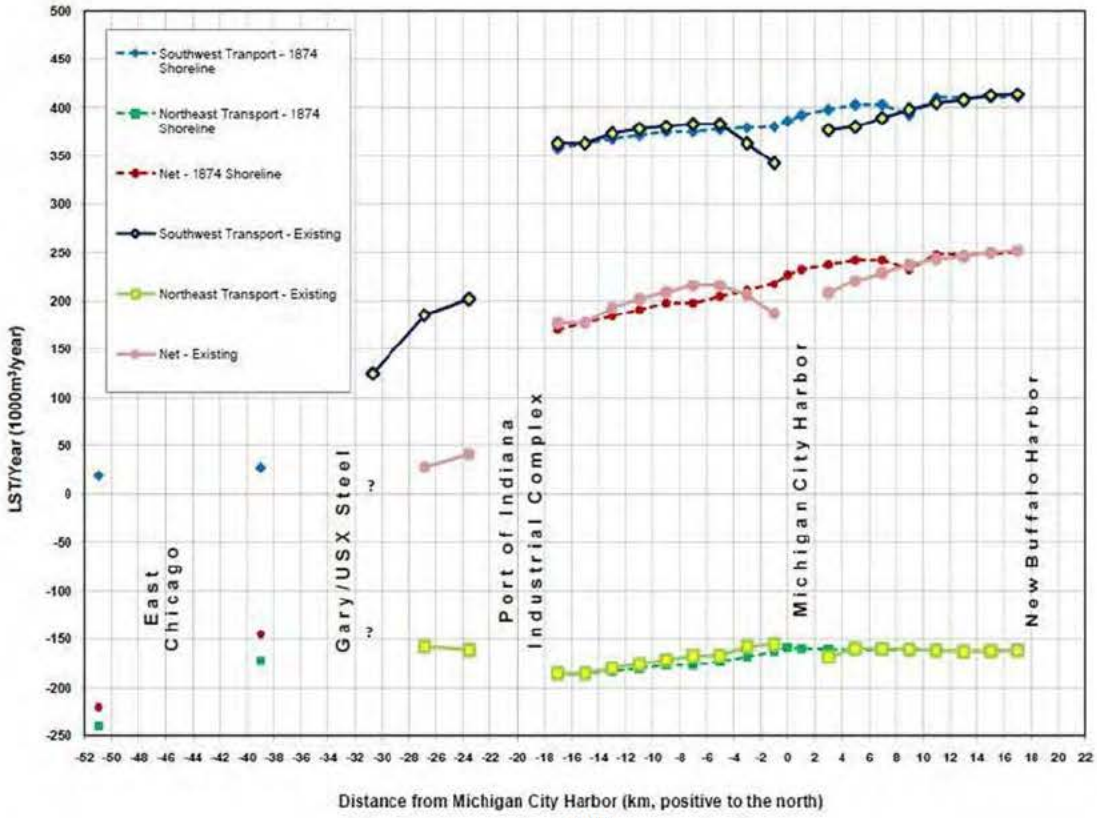


FIGURE 5: LST FOR CURRENT SHORELINE ORIENTATION



IMPLICATIONS FOR FUTURE SHORELINE CHANGE RATES

The following sections discuss the implications of the sediment transport modeling for future shoreline change rates in the study area, and provide baseline conditions for development of project restoration plans.

Future Trends at Harbors

There are three main areas within the project shoreline that constitute littoral barriers, disrupting the natural sediment flow in an alongshore direction. These man-made harbors trap sediment on the northeast or updrift side and lead to erosion on the southwest or downdrift side.

The three main harbors are:

- Michigan City Harbor (initial construction in 1834, Harbor completed in early 1900s)
- Port of Indiana Industrial Complex (constructed in the late 1960s)
- Gary USX Steel (constructed in early 1900s)

The total impacts of these harbors are somewhat difficult to quantify. The analysis to estimate the total sediment volumes is based on detailed aerial photographs from pre-Harbor conditions to present; quantities dredged, and harbor bypassing. Based on preliminary calculations, the total quantities of accreted sediment immediately north-east of the harbors is:

- Michigan City Harbor: 28.2M cubic meters (36.8M cubic yards). Does not include the volume of sediment dredged in the navigation channel and artificially bypassed;
- Port of Indiana Industrial Complex: 3.5M cubic meters (4.6M cubic yards). Does not include sediment dredged and artificially bypassed/backpassed, which totals 1.7M cubic meters (2.2M cubic yards); and
- Gary USX Steel: 2.2M cubic meters (2.9M cubic yards). This is based on the current shoreline orientation defined by the confined disposal facility constructed post-1950.

Figures 6, 7, and 8 on pages 335 and 336 document the fillet beaches and historical shoreline change rates at the three harbors.

Trends for the National Lakeshore

A companion report entitled 1951/52 to 2010 Shoreline Change Analysis, Indiana Dunes National Lakeshore (Baird 2011) documented trends in the study area shoreline over the last 60 years. The following bullet points comment on anticipated future trends based on the findings of this report and the status quo for sediment bypassing and beach nourishment activities within the study area (refer to figure 6 in the Baird (2011) report for the locations of Reaches A to G):

- **Reach A - Mount Baldy Erosion Zone**: Despite the placement of over 1 million cubic yards of beach nourishment since 1974, the beach and dunes immediate downdrift of the Michigan City Harbor continued to erode. Based on the LST modeling and the downdrift sediment budget deficit, this trend will continue for the status quo beach nourishment program (approximately 29,000 cubic yards per year, long-term average quantity);
- **Reach B – Beverly Shores to the Middle of Dune Acres**: The long term trend of "dynamically stable" is anticipated to continue. Beach position will be dynamic and respond to changes in lake levels. Locally, periods of erosion may threaten infrastructures, such as the revetment protecting portions of Lake Front Drive along Beverly Shores;
- **Reach C (Port of Indiana Industrial Complex Fillet Beach) and Reach E (Town of Ogden Dunes)**: The shoreline position in these two reaches is highly modified by the Port of Indiana Industrial Complex, dredging and mechanical sediment bypassing. The shoreline trend for Reaches C and E will be highly dependent on the degree of sediment management in the future, which may be investigated by as part of a reconnaissance study by the USACE (anticipated 2012). The current trends are anticipated in the future;

- **Reach F – West Beach to Miller**: The trend of dynamically stable will continue in the future if the status quo for sediment bypassing continues; and
- Reach G – Gary USX Steel Harbor Fillet Beach: Continued fillet beach growth is anticipated.

FIGURE 6: 1834 TO 2002 SHORELINE COMPARISON AT MICHIGAN CITY

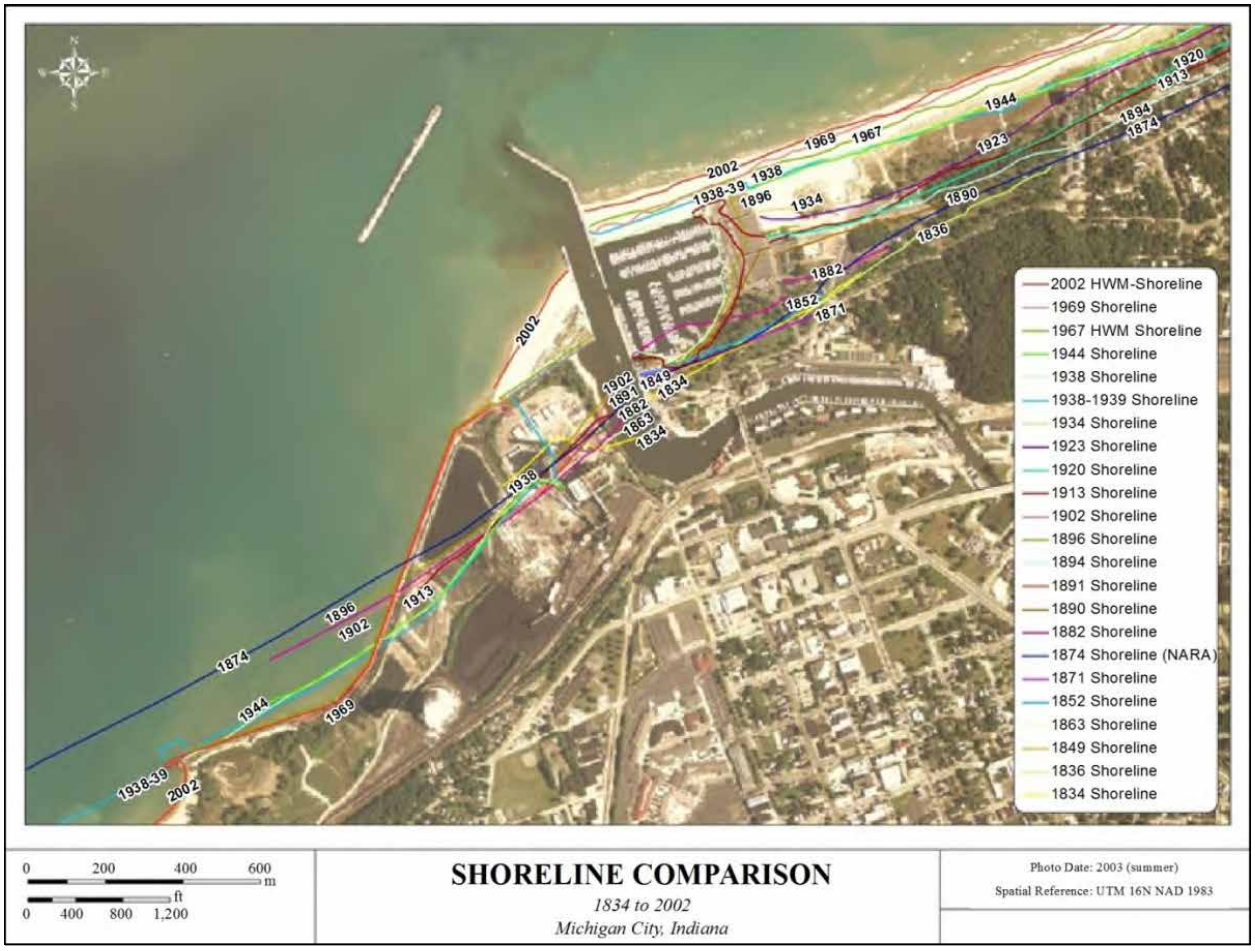


FIGURE 7: 1951/1952 TO 2010 FILLET BEACH AT THE PORT OF INDIANA INDUSTRIAL COMPLEX

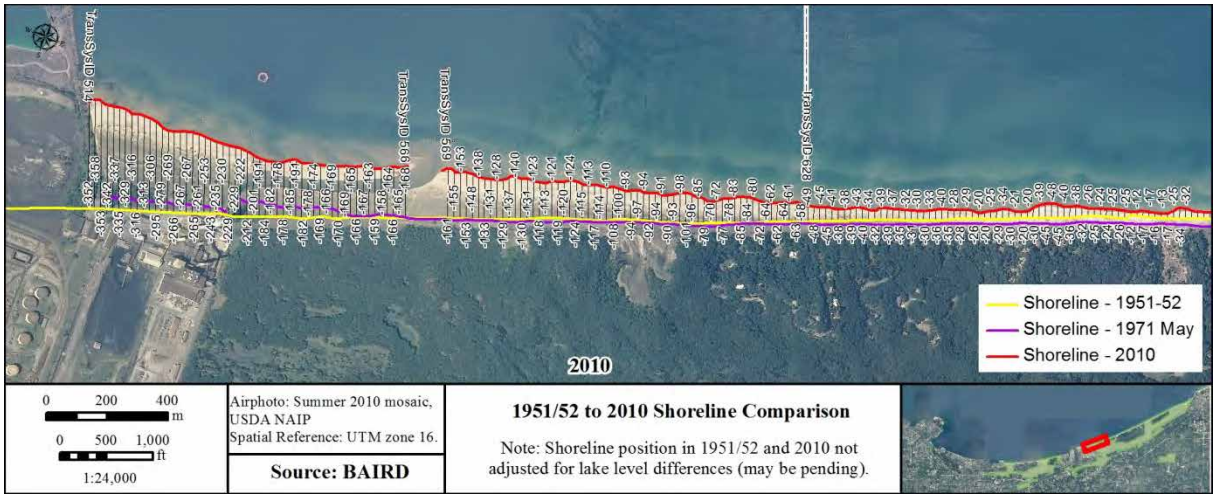
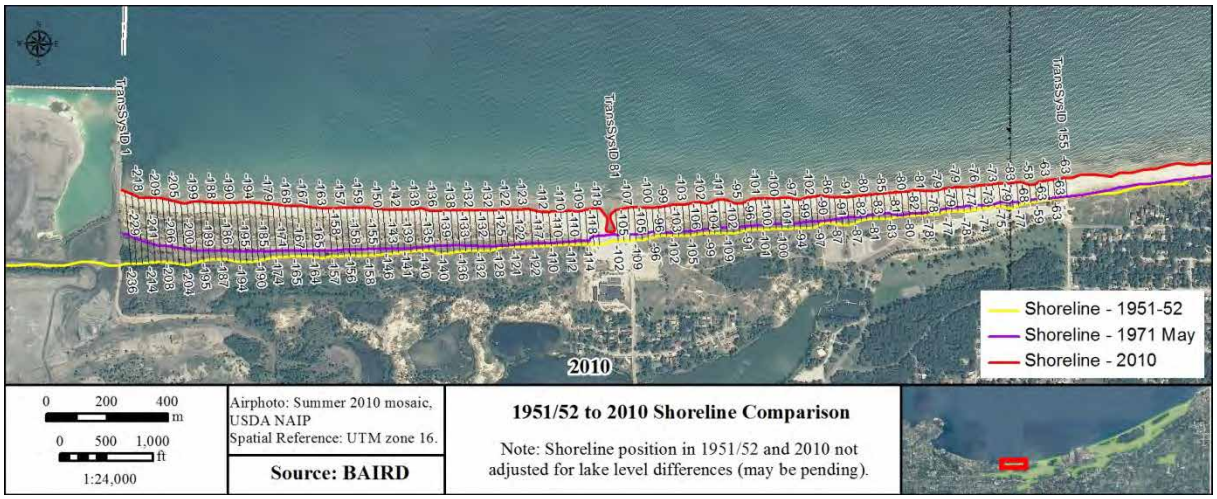


FIGURE 8: 1951/1952 TO 2010 FILLET BEACH AT THE GARY/USX STEEL HARBOR



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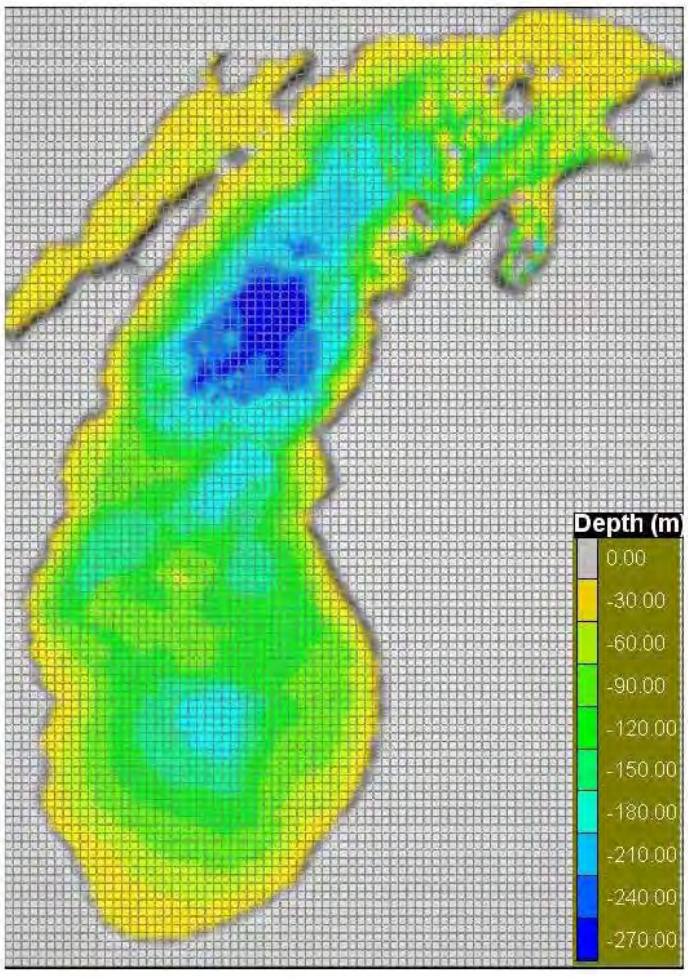
1993 Design Water Level Determination on the Great Lakes.

APPENDIX C2: LAKE MICHIGAN WAVAD HINDCAST — 1982 TO 2007

The wave climate for the southern end of Lake Michigan was initially evaluated with the aid of WIS data (specifically LM007) but it did not cover a suitable temporal period (WIS extends from 1956-1987) and was only 3 hour data. Therefore, a limited WAVAD wind-wave hindcast was completed for Lake Michigan (1982-2007), with output saved for the grid cells for the southern end of the lake. The primary input to WAVAD was 25 years of wind data obtained from offshore NOAA buoy #45007. Since the buoy is decommissioned in the winter, this period was covered using wind data from Milwaukee Mitchel Airport. Figure 1 shows the model grid, which contains 82 x 116 grid points. The grid spacing is 0.04 deg.

A detailed description of the WAVAD model and application on Lake Ontario is provided in Baird (2003) and Scott et al.(2004). A description of a recent application on Lake Erie is provided in Baird (2008).

FIGURE 1: WAVE MODEL GRID



The model results were verified against the offshore buoy data. Figure 2 presents the quantile-quantile (Q-Q) plot between measured and modeled output at the offshore buoy location. Figure 3 on page 339 shows the time series comparison of measured and modeled data. In general, the modeled wave height results agree well with measured data, but slightly underestimates the large waves (Hm0 >2.5 m). Figure 4 on page 340 presents a snapshot of the model result.

FIGURE 2: Q-Q COMPARISON BETWEEN MEASURED AND MODELED WAVE HEIGHT

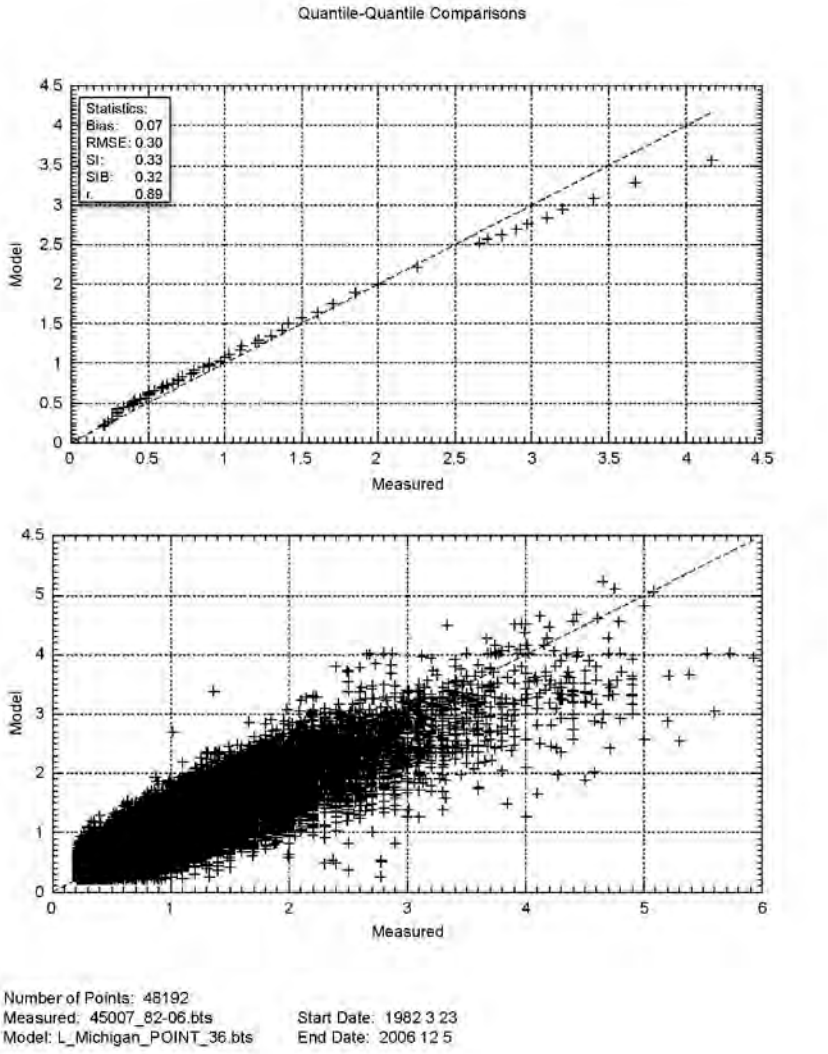


FIGURE 3: TIME SERIES COMPARISON BETWEEN MEASURED AND MODELED RESULT

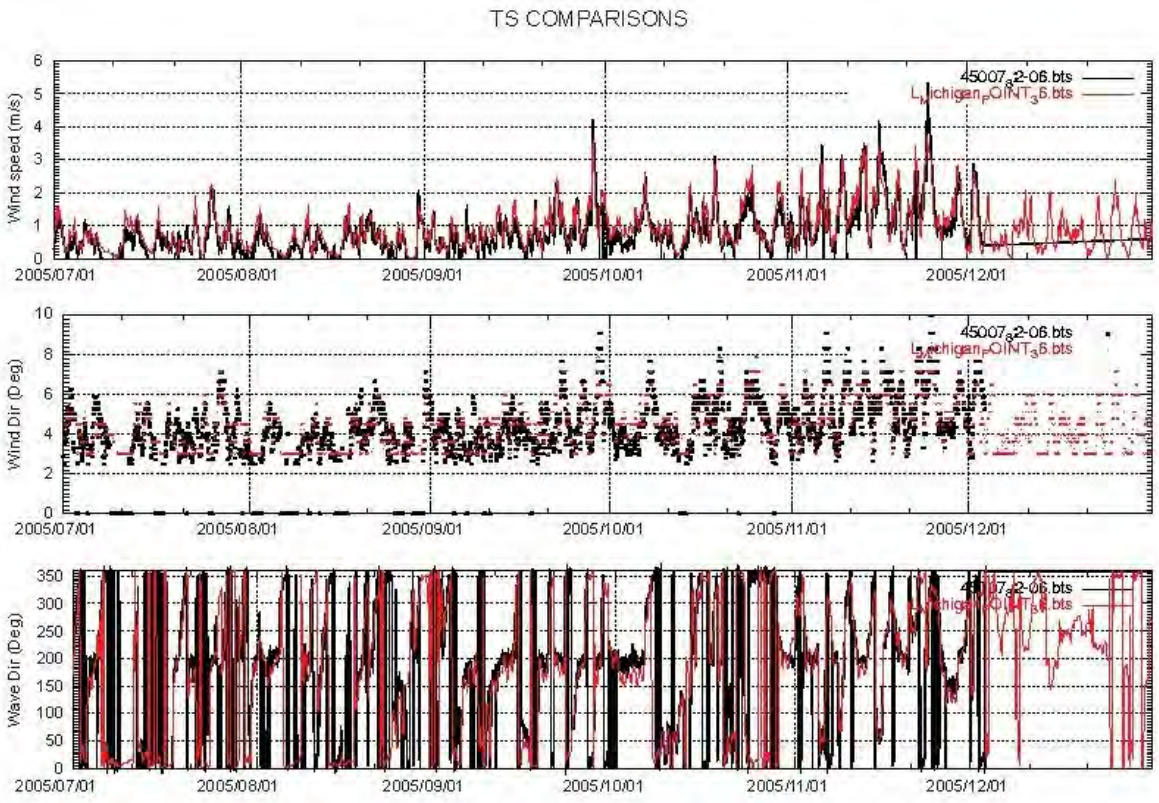
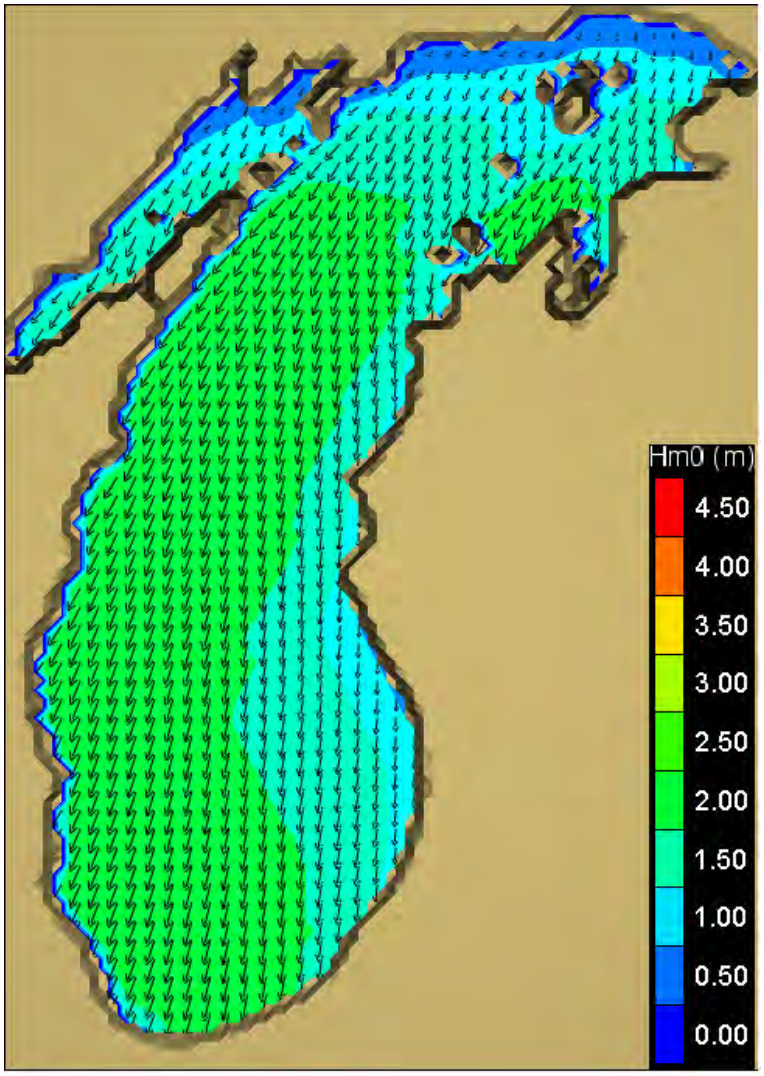


FIGURE 4: A SNAPSHOT OF WAVE MODEL RESULT



APPENDIX C3: 1951/1952 TO 2010 SHORELINE CHANGE ANALYSIS

SITE

Indiana Dunes National Lakeshore (INDL) is located at the southern end of Lake Michigan, with the coastal boundaries of the park defined by Michigan City Harbor in the northeast and Gary/USX Steel Harbor in the west. Refer to figure 1 for a location map. This is a highly modified coastal environment. It is also a landscape of contrast, featuring some of the most unique beaches and coastal dune habitat in North America, located in between large lakefill projects, ports and harbors.

This report describes the methods, results and implications of a shoreline change analysis for Indiana Dunes National Lakeshore completed with aerial photography from 1951/52 to 2010. The analysis is regional in nature, not focused on individual properties or a small segment of beach. Rather, this is a high level analysis of long term changes in the shoreline position over the last 60 years.

Older aerial photographs than 1951 might exist to document the shoreline evolution and the construction of man-made structures (the first jetties at Michigan City were constructed in 1836). However, the shoreline chance focus is on understanding the last 60 years of data and using this information to make management decisions for future project planning and implementation.

Another set of acquired aerial photographs covered the period of May 1971, which closely follows the completion of the lakefill project for the Port of Indiana.

INFLUENCE OF LAKE LEVELS AND STORMS

This region of Lake Michigan is classified as a sandy shoreline and in fact is one of the sandiest regions of the entire Great Lakes (Baird 2001). In other words, there is an abundance of sand on the lake bottom, along the beaches and in the dunes. In a completely natural system, which this is not, sand is transported in both a longshore and cross-shore direction in response to waves and currents generated during storms. Over long temporal periods, the magnitude and directionality of the storms influences the rate at which sand is transported along the coast and ultimately the resulting morphology of the shoreline. From previous technical studies, the net direction for longshore sediment transport within the limits of the study are from the northeast to the southwest (Baird 2004). Additional sediment transport modeling was completed to quantify the longshore rates (see Wave Climate and Longshore Sediment Transport Analysis).

FIGURE 1: LOCATION MAP FOR INDIANA DUNES NATIONAL LAKESHORE

Sandy shorelines are, by definition, dynamic. The position of the waterline, beach width and dunes are constantly responding to changes in lake levels and severe storm events. For example, the nearshore lake bottom, bars and beach respond to periods of rising lake levels by transferring sediment offshore (in a cross-shore direction), often leading to erosion of the dune and beach. Conversely, during periods of falling or low lake levels, sand is transferred onshore, beach width increases and aeolian processes transfer more sand into the foredune. This is typically a period of beach and dune building in the Great Lakes.

The long term lake level cycles for Lake Michigan, as recorded by the lakewide monthly mean water level, are presented in figure 2. Low Water Datum (LWD) is noted with the red line. The natural range for the still water level is almost 7 feet, which excludes the effects of storm surge. Since 1998, Lake Michigan water levels have been fluctuating in a range close to LWD, and for many locations within the study area, beaches have responded by migrating lakeward, new foredunes are growing and dune vegetation has migrated lakeward. Refer to the beach conditions in figures 3 and 4. Both pictures document a growing broad wide foredune; given the lack of shrub/woody vegetation, this accumulation began during the current low lake level period.

During periods of rising lake levels or the highs recorded in the early 1970s, mid 1980s or late 1990s, the beaches within the study area would have been significantly smaller as sand is transported in an offshore direction. In some locations, active dune erosion was likely occurring during severe storm events. In figures 3 and 4, the limit of vegetation was likely much closer to the deciduous tree line along the older dune crest.

In addition to the cross-shore response of the beaches to fluctuating lake levels, the change in the water surface elevation from the low to high cycles also exerts a strong influence on beach conditions by either exposing or covering a significant portion of the sandy beach.

FIGURE 2: LAKE MICHIGAN MONTHLY MEAN LAKE LEVELS, 1865 TO PRESENT

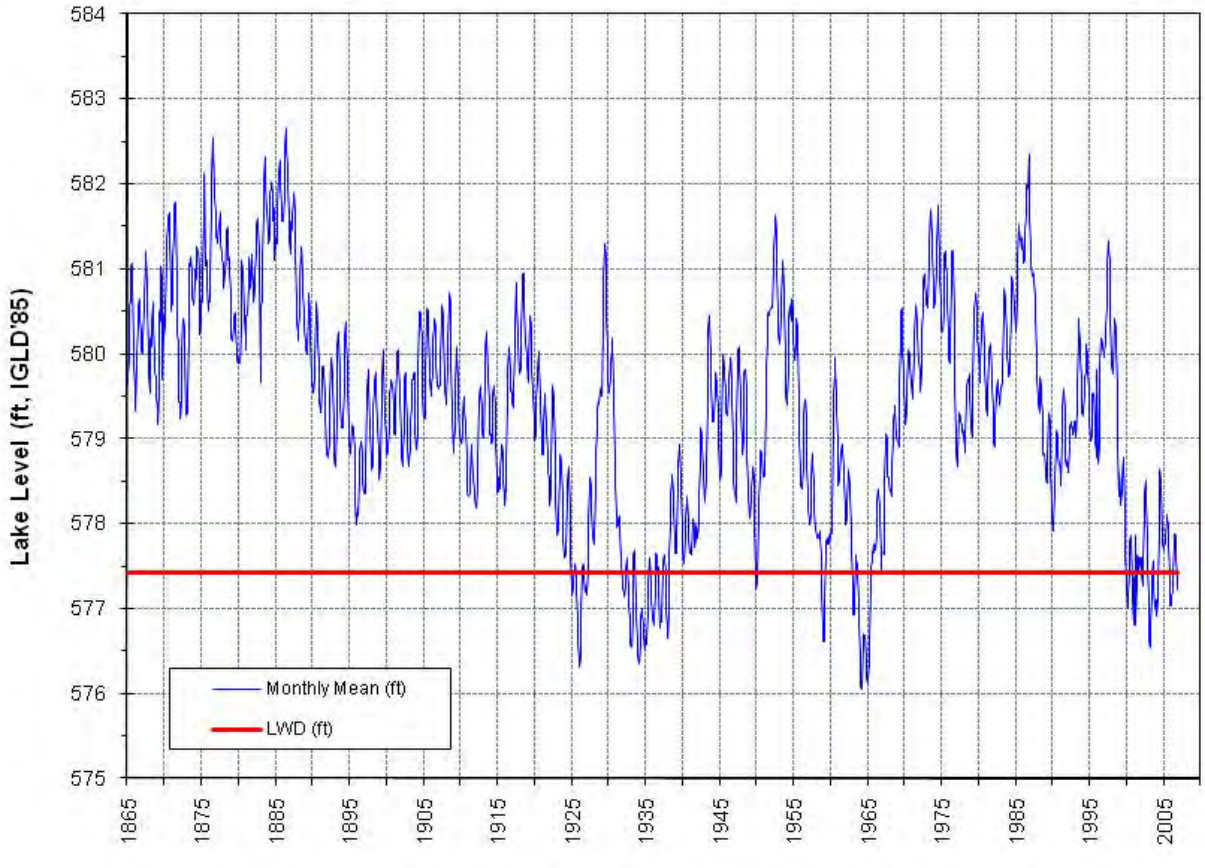


FIGURE 3: BEACH AT THE BOUNDARY OF BEVERLY SHORES AND INDIANA DUNES STATE PARK (LOOKING NORTHEAST)

FIGURE 4: BEACH CONDITIONS AT WEST BEACH, LOOKING WEST

INFLUENCE OF COASTAL STRUCTURES ON LONGSHORE SEDIMENT TRANSPORT

As discussed in Section 2.0, the direction of net longshore sediment transport within the study area is from the northeast to the southwest. When large coastal structures, such as a harbor or port, are constructed along the shoreline, they disrupt the natural flow of sediment. Typically, sediment accumulates on the updrift side of the structure, as it acts much like a large groyne. Refer to figure 5 for a conceptual sketch of this process. Downdrift of the structure, erosion typically occurs on the shadow of the port or harbor, as depicted in figure 5 for the groyne.

Within the limits of the study area, the shoreline evolution has been influenced by three very large port and harbor structures, namely the Michigan City Harbor, which is protected by Federal jetty structures, the Port of Indiana Industrial Complex, and the Gary Indiana/US Steel Harbor. The first structures at Michigan City were constructed in 1836 and have trapped approximately 36.6 million cubic yards of sediment (Baird 2005). The Port of Indiana Industrial Complex was much more recent, with construction completed in the late 1960s. The Gary Indiana/US Steel followed shortly after the Port of Indiana Industrial Complex. The influence of these large coastal structures on shoreline evolution within the study area is discussed in Section 5 of this report.

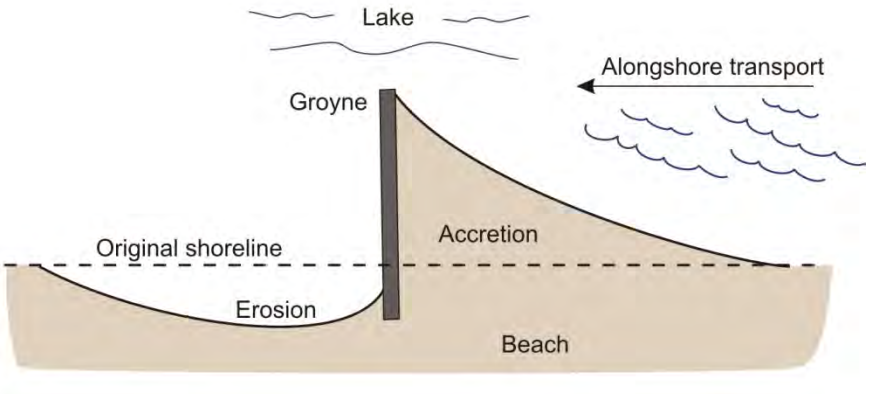
METHODS

The comparison of the shoreline position is based on aerial photo interpretation. Using photos from different temporal periods provides insight into long term trends. In order to compare photos from different temporal periods, the photos must be orthorectified. The orthorectification process takes aerial photos and removes the visual distortions created by topographical variations and the camera lens. Once an aerial photo has been orthorectified, it is commonly referred to as an orthophoto. When aerial photos from different time periods are orthorectified to a common geographic base, direct measurements and comparisons can be made between them.

The most recent set of aerial photographic imagery obtained for the study area is Summer 2010 from the US Department of Agriculture (USDA), Farm Service Agency (FSA), Aerial Photography Field Office (APFO), National Agriculture Imagery Program (NAIP).

These are provided by the USDA as ready-to-use orthophotos. The orthophotos have a 1 meter (3 feet) ground resolution. The oldest set of available and acquired aerial photos with sufficient resolution detail is a set of photos

FIGURE 5: INFLUENCE OF COASTAL STRUCTURES (GROYNES) ON BEACH ACCRETION AND EROSION



from December 1951 and March 1952 from the US Department of the Interior (USDI), US Geological Survey (USGS). These photos were orthorectified using PCI Geomatica's OrthoEngine software, using ground control information taken from the USDA 2010 orthophotos and using an elevation model provided by the USGS. These orthophotos have a ground resolution of 3 meters (9 feet).

To compare the shoreline position change between these two time periods, the visible water's edge was digitally traced using E.S.R.I.'s ArcGIS ArcMap software at a scale of 1:3,000 and is considered as shoreline for the water level on the day of the photography. Since the water level in 1951/52 and 2010 were not identical, direct measurements between these two shorelines would introduce a bias associated with the lower lake level conditions during the 2010 photography. Table 1 summarizes all the photographs utilized in this analysis, along with the date of capture and the associated monthly mean lake level (ft, IGLD'85).

TABLE 1: SUMMARY OF AIR PHOTOGRAPHS AND MONTHLY MEAN LAKE LEVELS

Date	Shoreline Extent	Monthly Mean Lake Level (feet)
12/9/1951	Gary to Beverly Shores	580.5
3/27/1952	Beverly Shores to Michigan City	580.6
5/3/1971	Gary to Port of Indiana Industrial Complex	580.3
5/14/1971	Port of Indiana Industrial Complex to Michigan City	580.3
06 to 08/2010	Entire Study Area	578.3

The lake surface elevation difference between the 1951/52 photos and those captured in 2010 was 2.25 ft. To correct for this difference in lake levels, the beach and nearshore slopes for the sections of shoreline between Michigan City and the Port of Indiana Industrial Complex were analyzed next. Using recent LIDAR topography and bathymetry, the average beach slope between the 580.5 to 583.5 ft contours (IGLD'85) was calculated to be 1:18 (V:H). The same procedure was applied to a 2,300-foot stretch of shoreline between the Port of Indiana Industrial Complex and Gary. Here the calculated beach slope was 1:15 (V:H).

Since the trend in lake levels between the 1951/52 aerial photograph and 2010 was a drop in water level of 2.25 ft, and the former lakebed in 1951/52 is now exposed due to lower water level conditions, the nearshore slope was also calculated between the 570 and 580 ft contours for the shoreline between Michigan City and the Port of Indiana Industrial Complex. Based on the detailed LIDAR bathymetry, an average nearshore slope of 1:35 (V:H) was calculated. This slope (1:35) was used to correct the shoreline change transects described in the following paragraphs.

To measure the change between these two shorelines, Baird has developed a tool that automates the process of measuring transects between the shorelines at a user defined interval (Zuzek et al, 2003) along a fixed baseline. For this study area, an interval of 66 feet was chosen, resulting in 1,450 transect lines measuring the difference in the shoreline position from 1951/52 and 2010. The individual transects are coded with information such as length, angle and trend (erosion/accretion). The length of each individual transect was corrected in our spreadsheet to account for the lakeward position of the 2010 shoreline due to a lake level that was 2.25 feet lower than the conditions that existed in 1951/52. The corrected transect information was used to characterize the change in shoreline position at the individual transects and establish regional trends or reaches within the study limits.

RESULTS

The study area from Michigan City to Gary Indiana has been sub-divided into seven reaches based on the recorded long term shoreline change trends. The reach name, length, trend and average shoreline change rate is summarized in table 2 and visually in the figures attached at the end of this report. To note that the erosion transects are shown in red and the accretion transects are depicted in yellow.

TABLE 2: SHORELINE REACHES AND LONG-TERM TREND (1951/52 TO 2010)

Reach	Name	Approximate Length	Trend	1951/52 to 2010 Average Shoreline Change Rate
Michigan City				
A	Mount Baldy Erosion Zone	11,300 ft	Erosion	4.5 ft/yr
B	Beverly Shores to Dune Acres	42,600 ft	Dynamically Stable	n/a
C	Port of Indiana Industrial Complex Fillet Beach	7,700 ft	Accretion	7.6 ft/yr
Port of Indiana Industrial Complex				
D	Burns Waterway Small Boat Harbor–Fillet Beach	3,900	Accretion	2.1 ft/yr
E	Town of Ogden Dunes	3,900 ft	Erosion	2.7 ft/yr
Gary Indiana / U.S. Steel				
F	West Beach to Miller	15,100 ft	Dynamically Stable	n/a
G	Gary USX Steel Harbor–Fillet Beach	11,500 ft	Accretion	5.1 ft/yr

Notes:

ft = feet

ft/yr = feet per year

U.S. = United States

The shoreline transects for the study area are plotted in detail on a series of formatted map panels and attached to this report. Each map presents the 1951/52 photograph with the 1951/52 and 2010 shorelines and the 2010 photograph with the 1951/52 and 2010 shorelines overlaid. On these maps, the shoreline position was not corrected. However, the individual transect measurements were corrected for the shoreline change rates reported in table 2 above.

It is also worth noting that the 1971 shoreline is also included on the individual map tiles. The difference in the lake level from 1951/52 to 1971 was 0.25 ft and thus the actual positions can be compared without a correction. This photo series was selected for the analysis since it corresponded closely to the post-construction era for the Port of Indiana and Gary. A summary of the shoreline change analysis results is presented as follows.

Reach A: Downdrift of the Michigan City jetties and the steel sheet pile wall protecting the NIPSCO property, the Mount Baldy erosion zone extends approximately 2 miles. The long-term erosion rate for this reach is 4.5 ft/yr. Without the ongoing nourishment program, the erosion rate would be even higher.

Reach B: This reach extends from the Beverly Shores community to the western limits of the Dune Acres, a total distance of 8 miles. Between 1951/52 and present, once the transect measurements were corrected for lake level differences, the average rate of change was accretion of approximately 0.3 ft/yr (which is likely within the error limits of the analysis). The present waterline position is heavily influenced by the current period of low lake levels. Once high lake levels return, a considerable amount of this accreted beach will erode. Also, for many of the transects, the trend from 1951/52 and 1971 was actually erosion. Therefore, this portion of the study area has been classified as dynamically stable. In other words, both periods of erosion and accretion have occurred and will occur in the future. The product of these shoreline fluctuations is a net change of close to zero.

The dynamic nature of this shoreline is further highlighted by the 1951/52 to 2010 shoreline comparison for the Beverly Shores area. Although the beach has migrated lakeward from 1951/52 to 2010, some of cottages that were

located lakeward of the road are now gone. It is possible they were lost or damaged during the high lake period between early 1970 and late 1990. The visible waterline in the 1971 photo series confirms that parts of the shoreline eroded during this period of high lake levels.

Reach C: The updrift fillet beach at the Port of Indiana Industrial Complex is 1.5 miles in length and has been rapidly accreting since the port was constructed. The average accretion rate is 7.6 ft/yr. Without the Port of Indiana Industrial Complex, this sediment would be spread along the beaches of Ogden Dunes to Marquette Park.

Reach D: Since the construction of the jetties at the mouth of the Burns Waterway Small Boat Harbor, the relatively straight 1971 shoreline is re-aligned against the jetties. The average accretion rate from 1951/52 to 2010 is 2.1 ft/yr) for a distance of approximately 0.75 miles. However, based on the position of the 1971 shoreline, it appears the sand in this sub-cell has just migrated into the present fillet beach (not a net gain to the sub-cell).

Reach E: The beach fronting the Town of Ogden Dunes community has a long-term erosion rate of 2.7 ft/yr, which is attributed to the sediment starved conditions created by the Port of Indiana Industrial Complex.

Reach F: Between the Port of Indiana Industrial Complex and Gary USX Steel Harbor, 2.8 miles of shoreline is classified as dynamically stable. Although the average transect change rate was accretion of 0.65 ft/yr, this rate of change is considered to be within the error of the analysis and is also highly influenced by the present low water conditions. The position of the 1971 shoreline was very similar to the 1951/52 conditions. The present wide beach conditions could change significantly during average or high lake levels.

Reach G: The fillet beach adjacent to the Gary USX Steel Harbor-east breakwater is 2.2 miles in length and features an average accretion rate of 5.1 ft/yr. A significant volume of sediment has accumulated in this region and this process will continue, especially if dredging around NIPSCO intake and mechanical bypassing continue. At some point in the future, sediment will migrate along the outer limit of the Gary USX Steel Harbor and some will accumulate in the navigation channel.

USACE INDIANA SHORELINE MONITORING REPORT (2008)

The USACE has been nourishing the shoreline downdrift of Michigan City since 1974. In 2008 a comprehensive monitoring report was prepared to review the shoreline evolution between Michigan City and the Port of Indiana using aerial photographs and beach profile surveys. The following bullet points highlight key findings relevant to the present investigation for Indiana Dunes National Lakeshore:

- Between 1974 and 2004, nourishment was placed on the beach immediate east of Mount Baldy on 11 out of 30 years. A total of 925,000 cubic yards was placed from upland sources and sediment bypassed at Michigan City, for an annual average of approximately 30,800 cubic yards.
- Baird's (2004) sediment budget study determined there was a 105,000 cubic yard deficit at Mount Baldy due to the sand trapped at Michigan City. Therefore, despite the substantial effort to nourish the beaches downdrift of the harbor, erosion will continue until this deficit is substantially reduced.
- Since the focus of the investigation was monitoring downdrift shoreline evolution following the beach nourishment, aerial photographs were analyzed from 1979, 2000 and 2005. A 2 ft contour was derived from the photographs by digitizing the shoreline and adjusting the position landward or lakeward using a fixed beach slope. A fourth 2 ft contour was derived from a 1997 SHOALS survey of the study area.
- Shoreline change measurements were made of 400 ft intervals along a baseline from 1979 to 2005, then annualized as ft/yr. Qualitative descriptors were also generated for the measurements at 400 ft intervals. Figure 18 from the USACE report is reproduced in this report.
- The shoreline change analysis generally identified similar trends to the results summarized in this report, with significant erosion fronting the Mount

Baldy dunes even in light of the beach nourishment and a large accretion zone to the east of the Port of Indiana/NIPSCO plant. For the central portion of the shoreline (Beverly Shores and State Park), the USACE report identified accretion rates ranging from "very slow" to "moderate" to a few isolated cases of "rapid". The "rapid" classification appears to be attributed to sand waves moving along the coastline. The Baird analysis in this report for the central region concluded the shoreline was dynamically stable but it should be noted the duration of our analysis was much longer (1952/52 to 2010). From 1951/52 to 1971 the shoreline actually eroded in some locations, which was part of the rationale for classifying this region as dynamically stable. It should also be noted when positional errors due to photo registration and digitizing the shorelines are considered, small rates of change actually fall within the error limits of the analysis. Refer to Zuzek et al. (2003).

- Nine beach profiles offshore of Mount Baldy were analyzed from 1997 to 2005. Based on a 3 dimensional surface comparison of the raw point data, the net lakebed change was a small gain of 0.1 ft (averaged across the entire area). Refer to the figure reproduced in this report. It should be noted that the change was not uniform, with significant accretion at the shoreline (0 to +6 ft). This accretion was likely attributed to both the beach nourishment program and the significant drop in lake levels from 1997 to 2005. Offshore of the beach, there are significant areas were lakebed erosion ranging from 1 to 4 feet were documented. As the lakebed in this region is presumed to be exposed glacial sediment (lacustrine clay), this erosion represents the permanent removal and lowering of the lake bottom. This finding is an important design consideration for developing long-term shoreline stabilization options for the park in the future.

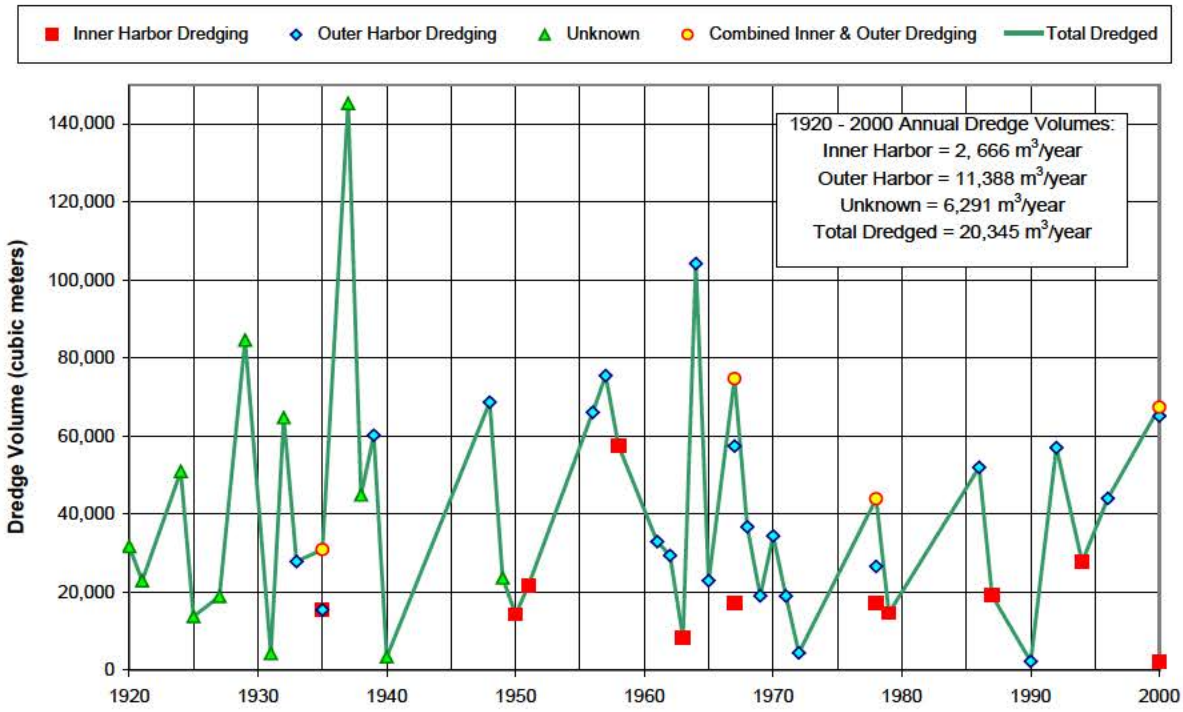
DREDGING AND BEACH NOURISHMENT SUMMARY

Dredging and beach nourishment data in the project area has been compiled from various sources. This data, together with the shoreline evolution analysis, will provide useful information in support of the shoreline restoration alternatives. The dredging and beach nourishment records for Michigan City were assembled by the USACE-Chicago District from 1920 to 2000. Data for Burns Harbor Waterway, Burns Small Boat Harbor and NIPSCO/Bailly Intake has been summarized from USACE from 1980 to 2009. The Mount Baldy beach nourishment data has been assembled from both NPS and USACE data.

Michigan City

The historical records provided the year and volume of sediment removed from the lake bed, but the location of the dredging is not specified. Consequently, the location of the dredging is categorized as: inner harbor, outer harbor, combined inner and outer harbor or unknown. The results of this analysis are presented graphically for the period of 1920 to 2000 in figure 6. The individual colored symbols indicate the location of the dredging, while the green line is the cumulative yearly total, regardless of location.

FIGURE 6: MICHIGAN CITY DREDGING SUMMARY



Burns Waterway, Small Boat Harbor and NIPSCO/Bailly

The historical records provided the for Burns Waterway Harbor between 1986 and 2009 show that a total of 537,000 cubic yards have been dredged, and placed as open-water disposal offshore of the Harbor.

Dredging records between 1985 and 2009 for the Burns Small Boat Harbor show that 282,000 cubic yards of materials have been removed and placed on the beach immediately west of the harbor breakwater (NPS Portage Lakefront), and in the near-shore area of Ogden Dunes.

The NIPSCO/Bailly water intake location has been dredged to -21 feet water depth at LWD since 1980 by NIPSCO and, starting in 2006, by USACE. The maintenance program has been irregular, making planning predictions of future dredging needs difficult.

A total of 2,212,000 cubic yards of sand has been removed and primarily placed in the near-shore area in front of Ogden Dunes (1,487,500 cubic yards) while Beverly Shores received a total of 311,500 cubic yards. The remaining quantity had an unspecified open-water placement location.

One noteworthy finding is that the Ogden Dunes beach nourishment started to occur in 1986, allowing placement of material 1,500 feet offshore, and 1,500 feet west of the Burns Waterway Small Boat Harbor inner breakwater. The dredged material placement involves open water disposal in a water depth between 12 feet (considered safe draft for opening split-hull barges bottom hull) and 18 feet (considered safe water depth in order not to allow the placed sand to migrate offshore). The most current permit (revised in 1995) allows placement within 1,500 feet of the shoreline.

Based on consecutive 2006, 2007, 2008, and 2009 dredging quantities, an average annual quantity of 118,000 cubic yards has been removed from the NIPSCO intake and placed at Ogden Dunes. To note that for 7 consecutive years (between 1999 and 2006) no dredging occurred. On a long-term (1986 to 2009) average basis, approximately 74,000 cubic yards have been placed at Ogden Dunes.

The Beverly Shores area was nourished only between 1986 and 1999, with an average quantity of 52,000 cubic yards per dredging event. No other nourishment records were found. Table 3 shows a summary of the Burns Waterway, Small Boat Harbor, and NIPSCO/Bailly quantities dredged.

TABLE 3: DREDGING SUMMARY FOR BURNS WATERWAY SMALL BOAT HARBOR (1980 TO 2009)

Project	Year	Qty. (cyds)
Burns Waterway Harbor	2009	49,000
	2008	55,000
	2007	100,0000
	1996	266,000
	1986	67,000
Burns Small Boat Harbor	2009	80,000
	2000	143,000
	1985	59,000
NIPSCO Intake (USACE Dredging)	2009	110,000
	2008	105,000
	2007	228,000
	2006	30,000
NIPSCO Intake (USACE Dredging)	1999	165,000
	1997	146,000
	1995	118,000
	1992	209,000
	1989	288,000
	1986	320,000
	1982	218,000
	1980	275,000
Total		3,3031,000

Mount Baldy

The beaches fronting Mount Baldy have been nourished since 1974. A total of 792,884 cubic yards have been trucked to the site from upland sources and placed on the beach. In addition, 371,373 cubic yards of sediment dredged hydraulically from the Michigan City Harbor has been placed on the beach. When annualized, approximately 31,465 cubic yards of sand has been placed since 1974 as a long-term average quantity. To note this is a lot less than the calculated 105,000 cubic yards deficit needed due to the sand trapped at Michigan City.

Therefore, despite the efforts to stabilize the shore, the beach and dune continue to erode at Mount Baldy. A summary of the Mount Baldy beach nourishment is presented in table 4.

TABLE 4: BEACH NOURISHMENT FOR MOUNT BALDY (1974 TO 2008)

Project	Year	Upland (Trucking) Qty. (cyds)	Michigan City Harbor (Hydraulic Dredging) Qty. (cyds)
Mount Baldy Beach Nourishment*	2010	56250	
	2008	17,273	30,159
	2007	17,273	
	2005	9500	13,962
	2004	17,500	
	2003	52,298	51,119
	2001	42,750	
	2000		85,251
	1999	36,000	
	1998	107,000	
	1997	73,000	
	1996	57,000	48,201
	1992		74,642
	1987		68,039
	1981	80,000	
	1974	227,000	
Total		792,844	371,373

Notes:
cyds = cubic yards
qty = quantity

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Baird

2001 FEPS Development and Application to the Lake Michigan Potential Damages Study Prototype Counties. Prepared for the USACE, Detroit District.

2004 Evaluation of Dredged Material Management Plans for Michigan City. Prepared for the USACE, Detroit District.

U.S. Army Corps of Engineers (USACE), Chicago District
2010 Burns Waterway Harbor, Indiana Shoreline Damage Mitigation Reconnaissance Study.

Zuzek, P.J., R.B. Nairn, and S.J. Thieme
2003 Spatial and Temporal Considerations for Calculating Shoreline Change Rates in the Great Lakes Basin. Journal of Coastal Research, Special Issue No. 38.

Reach C: Accretion
2.3 meters/year
7.6 feet/year

Reach B: Dynamically Stable

Reach A: Erosion
1.4 meters/year
4.5 feet/year

TransSysID: 514
TransSysID: 628
TransSysID: 900
TransSysID: 982
TransSysID: 1170
TransSysID: 1286
TransSysID: 1450

6
5
4
3
2
1

Broadway
Shore Ave.
Underwood Ave
Drake Ave.
Central Ave.
Mount Baldy

Mount Baldy to Port of Indiana

0 500 1,000 1,500 2,000 m
0 2,000 4,000 6,000 ft
1:50,000

Legend
Indiana Dunes N.L. Park Boundary
Shoreline Change Trend
Accretion
Erosion

Reach G: Accretion
1.6 meters/year
5.1 feet/year

Reach F: Dynamically Stable

Reach E:
Erosion
0.8 m/yr
2.7 ft/yr

Reach D:
Accretion
0.6 m/yr
2.1 ft/yr

TransSysID: 175
TransSysID: 406

9
8
7
6

Gary Harbor
Port of Indiana

Port of Indiana to Gary Harbor

Airphoto: Spring 2010 mosaic, USDA NAIP
Grid Spacing: 1000 meters
Spatial Reference: UTM zone 16

Summary of Regional Shoreline Change Analysis (1951/52 to 2010)

Mount Baldy to Gary Harbor

Reach A: Mount Baldy Erosion Zone
Trend: Erosion

Erosion Average: 1.4 meters/year, 4.5 feet/year

Limit of Analysis

1951-1952

TransSysID: 1326
TransSysID: 1360
TransSysID: 1394
TransSysID: 1426
TransSysID: 1450

Central Ave.
Kinzele Ditch
Crescent Ave.
Lake Park Ave.
Manor Ave.
Mount Baldy

2010

Legend

Shoreline Change Transects (meters)
Negative Values are Accretion
Positive Values are Erosion

Shoreline - 1951/1952
Shoreline - 1971May
Shoreline - 2010 Summer

0 200 400 m
0 500 1,000 ft
1:10,000

Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.

11761 NDU - Shoreline Comparison 1951-2010 Map Series (tabbutt).mxd
Map Published: 2011Jan17

Reach B: Beverly Shores to State Park
Trend: Dynamically Stable
(Note: When the 2010 shoreline position is corrected for water level differences, it is shifted landward 24 meters or 79 feet.)

Reach A: Mount Baldy Erosion Zone
Trend: Erosion

Erosion Average: 1.4 meters/year, 4.5 feet/year

1951-1952

2010

TransSysID: 1170

TransSysID: 1223

TransSysID: 1286

SysID: 1329

Shore Ave.

Lakeshore County Rd.

Drake Ave.

Park Boundary

Kansas Ave.

Central Ave.

Legend

Shoreline Change Transects (meters)
Negative Values are Accretion
Positive Values are Erosion

Shoreline - 1951/1952

Shoreline - 1971May

Shoreline - 2010 Summer

0 200 400 m

0 500 1,000 ft

1:10,000

Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.

11761 INDU - Shoreline Comparison 1951-2010 Map Series (tabloid).mxd

Map Published: 2011Jan17

Reach B: Beverly Shores to State Park
Trend: Dynamically Stable
(Note: When the 2010 shoreline position is corrected for water level differences, it is shifted landward 24 meters or 79 feet.)

1951-1952

2010

TransSysID: 982
TransSysID: 1008
TransSysID: 1042
TransSysID: 1090
TransSysID: 1170

tate Park Boundary
tate Park Boundary
Broad ay
hore Ave.
nder ood Ave

Legend

-45 Shoreline Change Transects (meters)
Negative Values are Accretion
Positive Values are Erosion

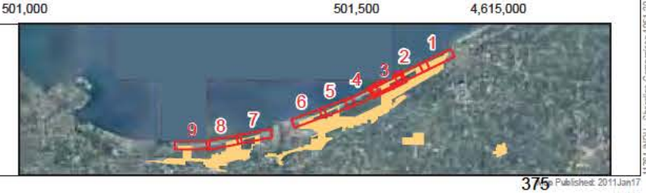
Shoreline - 1951/1952
Shoreline - 1971May
Shoreline - 2010 Summer

0 200 400 m
0 500 1,000 ft
1:10,000

Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.



11761 NDU - Shoreline Comparison 1951-2010 Map Series (tabloid).mxd
Date Published: 2011Jan17

Reach B: Beverly Shores to State Park
Trend: Dynamically Stable
(Note: When the 2010 shoreline position is corrected for water level differences, it is shifted landward 24 meters or 79 feet.)

1951-1952

2010

TransSysID: 849

TransSysID: 900

TransSysID: 982

TransSysID: 1008

Legend

Shoreline Change Transects (meters)
Negative Values are Accretion
Positive Values are Erosion

-45

Shoreline - 1951/1952

Shoreline - 1971May

Shoreline - 2010 Summer

0 200 400 m

0 500 1,000 ft

1:10,000

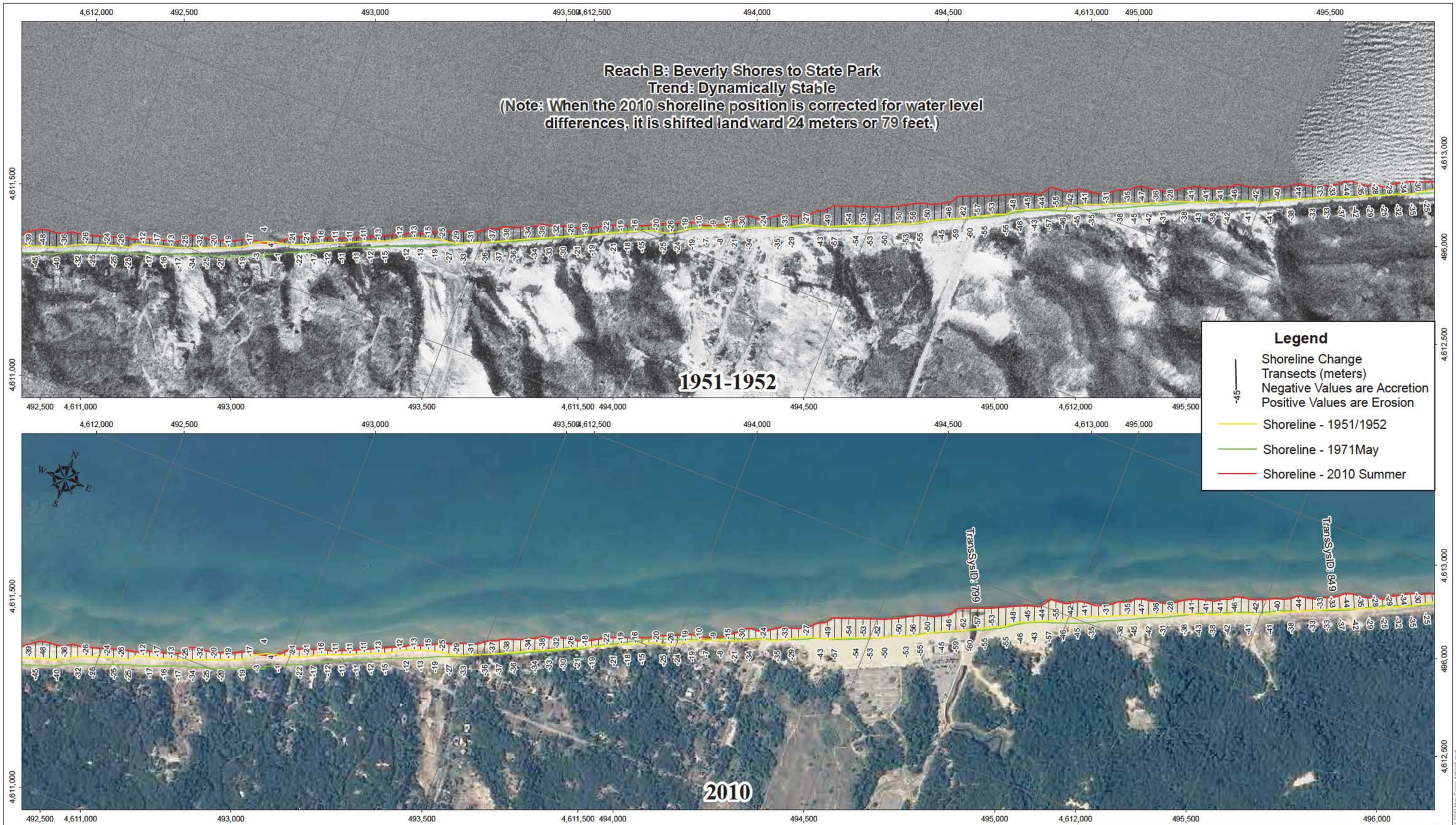
Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.

11761 INDU - Shoreline Comparison 1951-2010 Map Series (tabloid).mxd

Date Published: 2011Jan17



0 200 400 m

0 500 1,000 ft

1:10,000

Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.

11761 INDU - Shoreline Comparison 1951-2010 Map Series (tabloid).mxd

Publication Date: Published: 2011Jan17

Reach C: Port of Indiana Fillet Beach
Trend: Accretion

Lake Level Corrected
Accretion Average: 206 meters, 676 feet
Accretion Rate: 3.5 meters/year, 11.4 feet/year

Lake Level Corrected
Accretion Average: 80 meters, 262 feet
Accretion Rate: 1.4 meters/year, 4.4 feet/year

Reach B: Beverly Shores to State Park
Trend: Dynamically Stable
(Note: When the 2010 shoreline position is corrected for water level differences, it is shifted landward 24 meters or 79 feet.)

1951-1952

2010

TransSysID: 514
TransSysID: 566
TransSysID: 569
TransSysID: 629

Legend

-45 Shoreline Change Transects (meters)
Negative Values are Accretion
Positive Values are Erosion

Shoreline - 1951/1952
Shoreline - 1971May
Shoreline - 2010 Summer

0 200 400 m
0 500 1,000 ft
1:10,000

Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.

11761 NDU - Shoreline Comparison 1951-2010 Map Series (tabloid).mxd
Map Published: 2011Jan17

Reach F: West Beach to Lakeshore Drive
Trend: Dynamically Stable
(Note: When the 2010 shoreline position is corrected for water level differences, it is shifted landward 24 meters or 79 feet.)

Reach E: Ogden Dunes Erosion Zone
Trend: Erosion

Erosion Rate:
Lake Level Corrected
0.7 m/yr, 2.1 ft/yr

Lake Level Corrected
Erosion Rate:
1.2 m/yr, 3.9 ft/yr

Reach D: Burns Fillet Beach
Trend: Accretion

Lake Level Corrected
Accretion Rate: 0.6 meters/year, 2.1 feet/year

1951-1952

2010

TransSysID: 407
TransSysID: 461
TransSysID: 462
TransSysID
Burns Waterway
hore Dr.

483,000 483,500 484,000 484,500 485,000 485,500 486,000 486,500
4,608,000 4,608,500 4,609,000 4,609,500

Legend

-45- Shoreline Change Transects (meters)
Negative Values are Accretion
Positive Values are Erosion

Shoreline - 1951/1952
Shoreline - 1971May
Shoreline - 2010 Summer

0 200 400 m
0 500 1,000 ft
1:10,000

Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.

11761 NDU - Shoreline Comparison 1951-2010 Map Series (tabloid).mxd
Map Published: 2011Jan17

Reach F: West Beach to Lakeshore Drive
Trend: Dynamically Stable
(Note: When the 2010 shoreline position is corrected for water level differences, it is shifted landward 24 meters or 79 feet.)

1951-1952

2010

TransSysID: 278

County Line Rd.

ndiana Dunes
est Beach

479,500 480,000 480,500 481,000 481,500 482,000 482,500 483,000

4,608,000 4,607,500

Legend

-45 Shoreline Change Transects (meters)
Negative Values are Accretion
Positive Values are Erosion

Shoreline - 1951/1952
Shoreline - 1971May
Shoreline - 2010 Summer

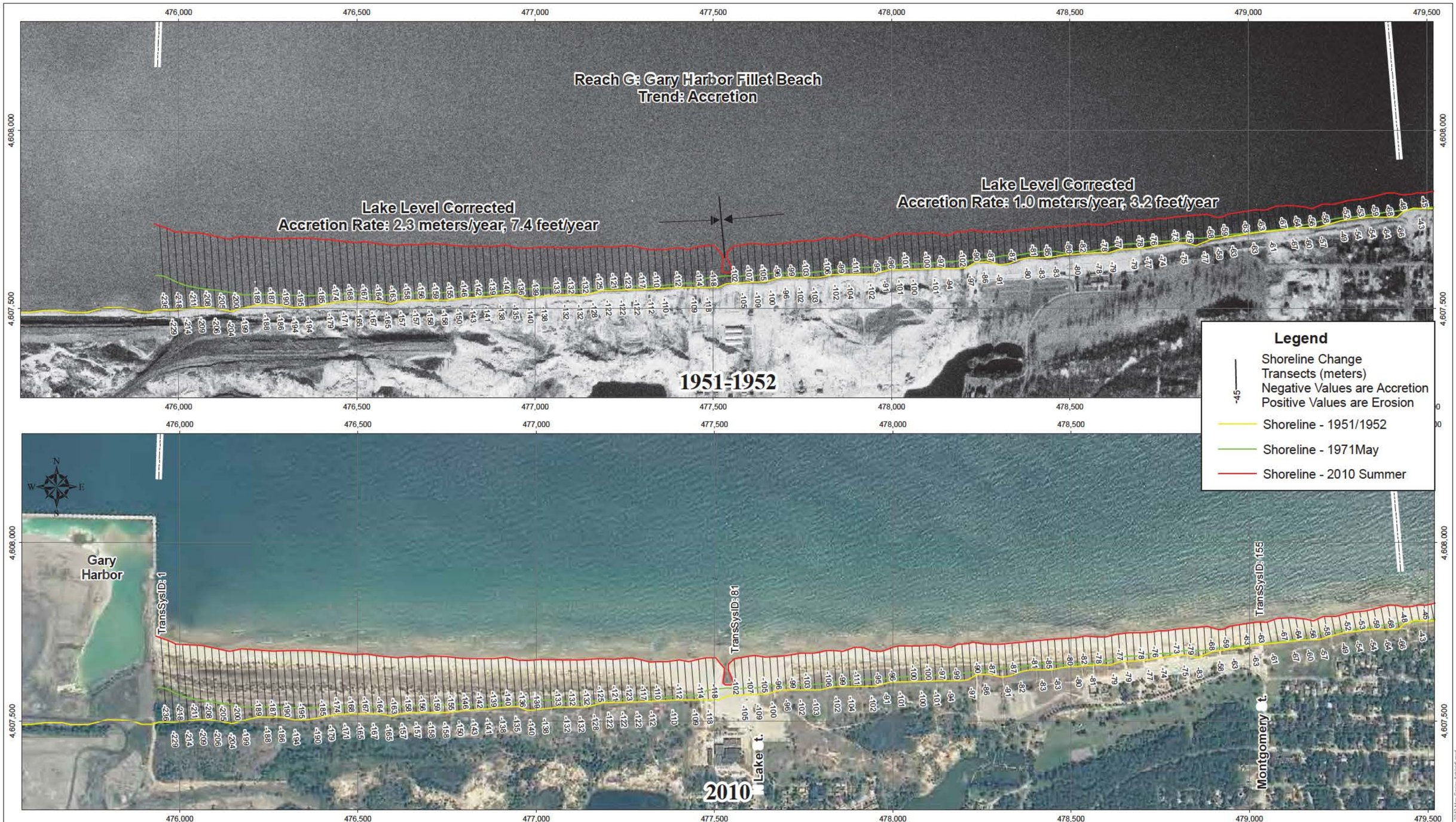
0 200 400 m
0 500 1,000 ft
1:10,000

Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.

11761 INDU - Shoreline Comparison 1951-2010 Map Series (tabloid).mxd
Map Published: 2011Jan17



0 200 400 m

0 500 1,000 ft

1:10,000

Top Airphotos: Dec 1951 and March 1952, USGS
Bottom Airphoto: Summer 2010 mosaic, USDA NAIP
Grid Spacing: 500 meters
Spatial Reference: UTM zone 16

1951/52 to 2010 Shoreline Comparison (transects in meters)

Note: Shoreline position in 1951/52 and 2010 not adjusted for lake level differences on these maps. However, individual transect values were adjusted for lake levels for the rates reported on these maps.

Map Published: 2011Jan17

11761 NDU - Shoreline Comparison 1951-2010 Map Series (tabloid).mxd

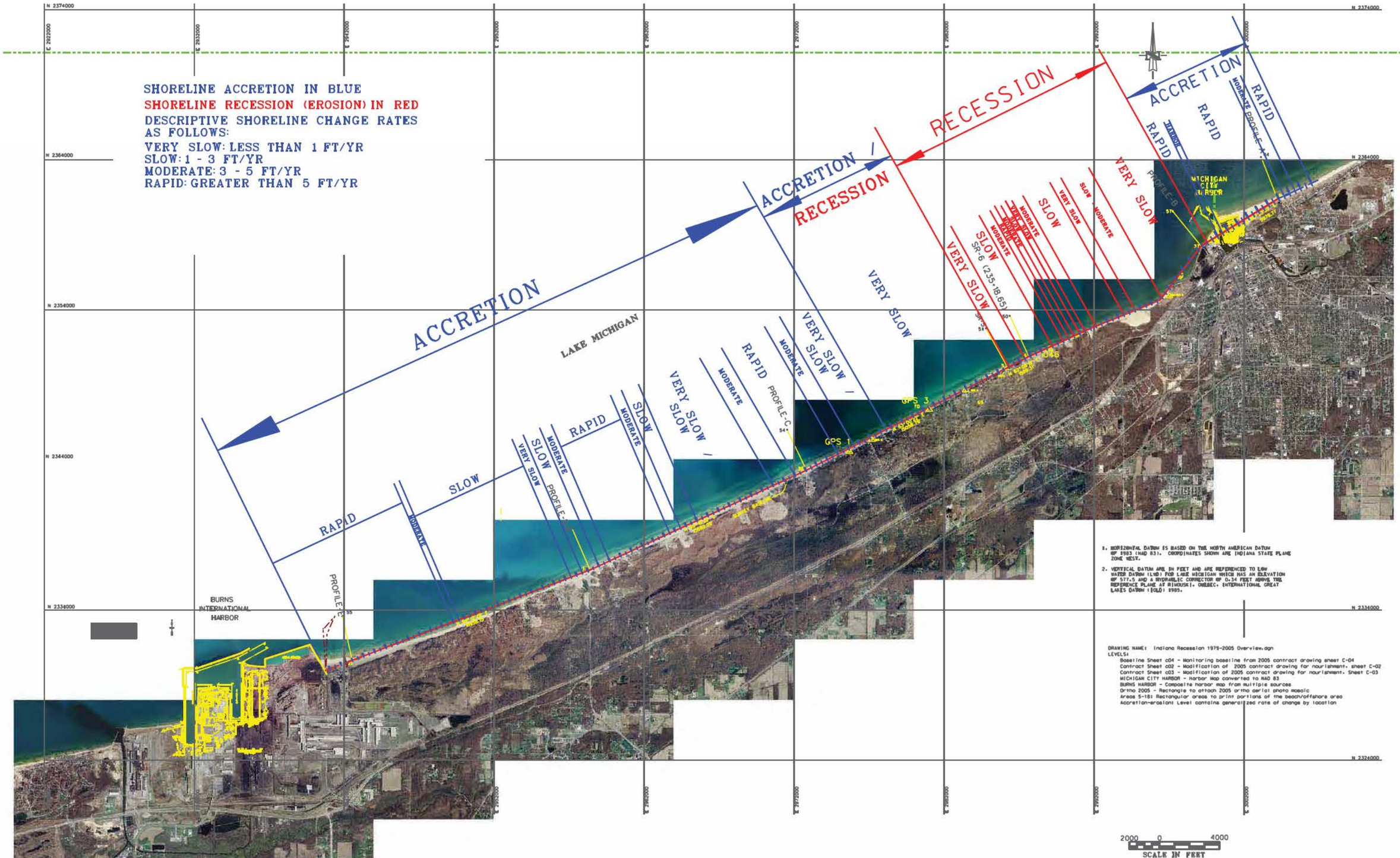
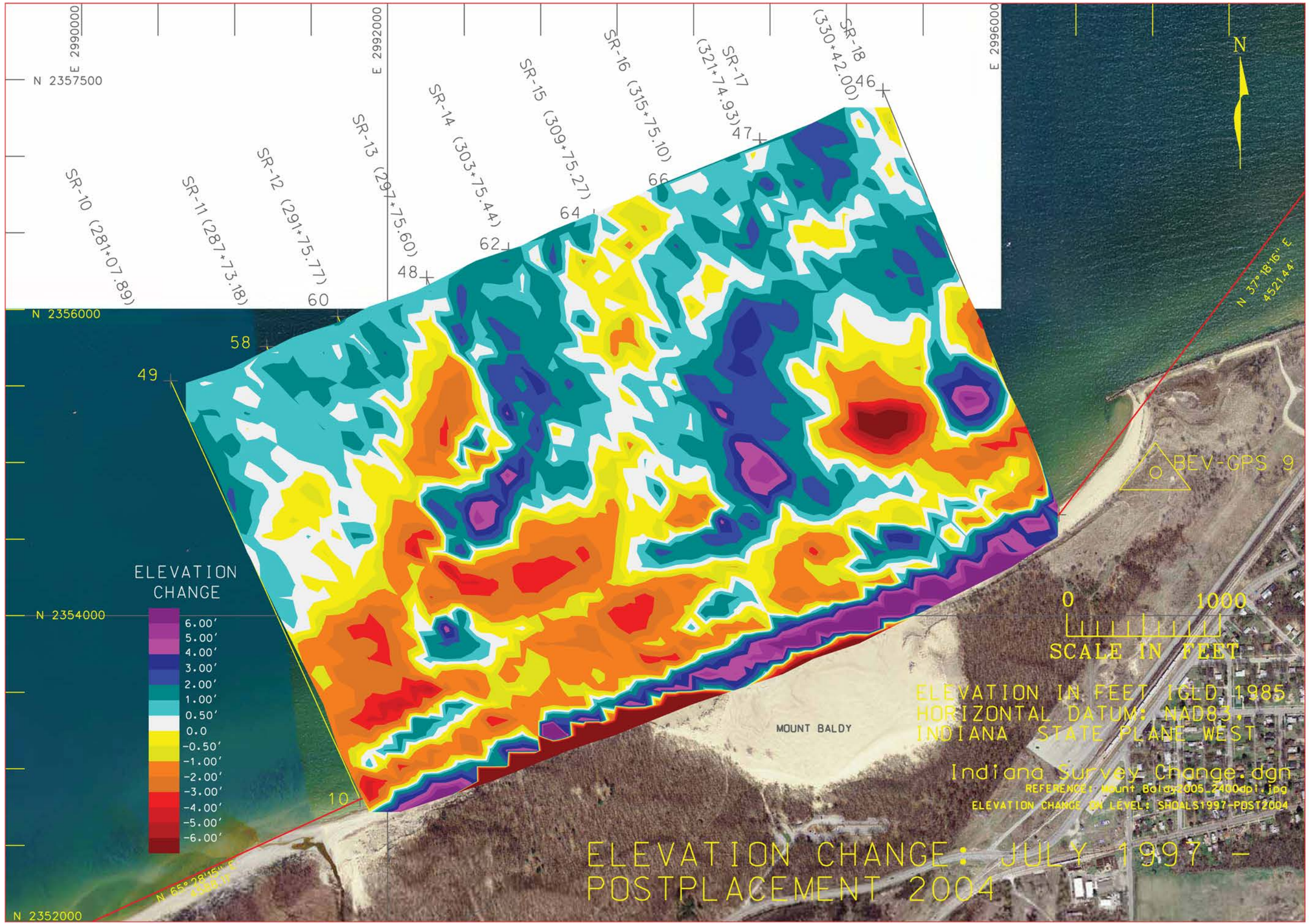


FIGURE 18. INDIANA SHORELINE RECESSION OVERVIEW: 1979–2005


E 2990000
E 2992000
E 2994000
N 2357500
N 2356000
N 2354000
N 2352000
SR-10 (281*07.89)
SR-11 (287*73.18)
SR-12 (291*75.77)
SR-13 (297*75.60)
SR-14 (303*75.44)
SR-15 (309*75.27)
SR-16 (315*75.10)
SR-17 (321*74.93)
SR-18 (330*42.00)
46
47
48
49
58
60
62
64
66
10
N
N 37°18'16" E
4521.44'
BEV-GPS 9
ELEVATION CHANGE
6.00'
5.00'
4.00'
3.00'
2.00'
1.00'
0.50'
0.0
-0.50'
-1.00'
-2.00'
-3.00'
-4.00'
-5.00'
-6.00'
0
1000
SCALE IN FEET
ELEVATION IN FEET IGLD 1985
HORIZONTAL DATUM: NAD83,
INDIANA STATE PLANE WEST
Indiana Survey Change.dgn
REFERENCE: Mount Baldy2005_2400dpi.jpg
ELEVATION CHANGE DV LEVEL: SHOALS1997-POST2004
MOUNT BALDY
ELEVATION CHANGE: JULY 1997 -
POSTPLACEMENT 2004

APPENDIX D: SPECIES LISTS

APPENDIX D1: REACH 1 ENDANGERED, THREATENED, AND RARE PLANT SPECIES LIST

INDIANA COUNTY ENDANGERED, THREATENED AND RARE SPECIES LIST FOR REACH 1 LAPORTE COUNTY (CRESCENT DUNE TO LAKEFRONT DRIVE EAST/CENTRAL BEACH)

Species Name	Common Name	Federal	State	INDU Locations/ Notes
Vascular Plants				
Arctostaphylos uva-ursi	bearberry, bearberry manzanita, kinnikinnick, mealberry		SR	Foredune complex, dune complex
Minuartia michauxii var. *michauxii*			SR	Prairie-dry, foredune complex
Aristida longespica var. *geniculata*			SR	
Aristida tuberculosa	seaside threeawn		SR	
Symphyotrichum sericeum	western silver aster		SR	
Cornus rugosa	round-leaf dogwood, roundleaf dogwood		SR	
Corydalis sempervirens	rock harlequin		ST	
Diervilla lonicera	northern bush honeysuckle, northern bush-honeysuckle		SR	
Drosera intermedia	spoonleaf sundew		SR	
Eleocharis melanocarpa	blackfruit spikerush		ST	
Epigaea repens	trailing arbutus		WL	
Equisetum variegatum	variegated horsetail, variegated scouring-rush, variegated scouringrush		SE	
Juncus balticus var. *littoralis*	Baltic rush		SR	
Juncus pelocarpus	brownfruit rush		SE	
Juncus scirpoides	needlepod rush		ST	
Juniperus communis var. *depressa*	common juniper		SR	Dune complex, foredune complex
Lathyrus japonicus var. *maritimus*	beach pea		SE	Foredune complex
Linum striatum	ridged yellow flax, rigid flax		WL	
Lycopodiella inundata	inundated clubmoss		SE	

Species Name	Common Name	Federal	State	INDU Locations/ Notes
Myriophyllum pinnatum	cut-leaf water-milfoil, cutleaf watermilfoil, green parrotfeather		SE	
Najas gracillima	slender waternymph		ST	
Oenothera perennis	little evening-primrose		SR	
Oryzopsis asperifolia	roughleaf ricegrass, white-grain mountain-rice grass		SE	
Piptatherum pungens	mountain ricegrass		SX	
Pinus banksiana	black pine, gray pine, hudson bay pine, jack pine, scrub pine		SR	Dune complex, foredune complex
Pinus strobus	eastern white pine, eastern white pine, northern white pine, soft pine, weymouth pine, white pine		SR	
Platanthera hyperborea	northern bogorchid, northern green orchid		ST	
Polygonella articulata	coastal jointweed		SR	Dune complex, foredune complex
Polygonum careyi	carey's smartweed, Carey's smartweed, renouée de Carey		ST	
Potamogeton friesii	flat-stalk pondweed, Fries' pondweed		ST	
Potamogeton praelongus	white-stem pondweed, whitestem pondweed		ST	
Potamogeton pulcher	heartleaf pondweed, spotted pondweed		SE	
Potamogeton pusillus	baby pondweed, small pondweed		WL	
Potamogeton robbinsii	Robbins pondweed, Robbins' pondweed		SR	
Potamogeton strictifolius	narrowleaf pondweed, straight-leaf pondweed		ST	
Argentina anserina	silverweed cinquefoil		ST	Foredune complex
Prunus pensylvanica	fire cherry, pin cherry		SR	
Rhynchospora scirpoides	longbeak beaksedge		ST	
Pyrola americana	American wintergreen		SR	
Clinopodium arkansanum	limestone calamint		SE	

Species Name	Common Name	Federal	State	INDU Locations/ Notes
Sisyrinchium montanum	mountain blue-eyed grass, mountain blue-eyed grass, strict blue-eyed grass, strict blue-eyed-grass		SE	
Solidago simplex var. *gillmanii*	Deam's goldenrod, Rand's goldenrod		ST	Foredune complex, blowouts/open dunes
Sparganium androcladum	branched bur-reed, branched burreed, branching bur-reed		ST	
Triantha glutinosa	sticky tofieldia		SR	
Utricularia subulata	zigzag bladderwort		ST	

Source: IDNR (2011); Wilhelm (1990)

Notes:

SX = state extirpated
SE = state endangered
ST = state threatened
SR = state rare
SRE = reintroduced
WL = watch list

APPENDIX D2: REACH 2 ENDANGERED, THREATENED, AND RARE PLANT SPECIES LIST

INDIANA COUNTY ENDANGERED, THREATENED AND RARE SPECIES LIST FOR REACH 2 PORTER COUNTY (BEVERLY SHORES TO INDIANA DUNES SP)

Species Name	Common Name	Federal	State	INDU Locations/Notes
Vascular Plant				
Arctostaphylos uva-ursi	bearberry, bearberry manzanita, kinnikinnick, mealberry		SR	
Minuartia michauxii var. *michauxii*	Michaux's stitchwort		SR	Prairie-dry, foredune complex
Aristida longespica var. *geniculata*			SR	
Aristida tuberculosa	seaside threeawn		SR	
Symphyotrichum sericeum	western silver aster		SR	
Carex aurea	golden sedge, golden-fruit sedge		SR	
Carex eburnea	bristle-leaf sedge, bristleleaf sedge		SR	
Carex garberi	elk sedge, Garber's sedge		ST	
Chimaphila umbellata ssp. cisatlantica	pipsissewa		ST	
Cirsium pitcheri	Pitcher's thistle, sand dune thistle	LT	ST	Foredune complex, confined to blowouts
Cornus rugosa	round-leaf dogwood, roundleaf dogwood		SR	
Cyperus houghtonii	Houghton's flatsedge		SE	
Dichanthelium portoricense	Hemlock Witchgrass		SR	
Diervilla lonicera	northern bush honeysuckle, northern bush-honeysuckle		SR	
Drosera intermedia	spoonleaf sundew		SR	
Eleocharis melanocarpa	blackfruit spikerush		ST	
Epigaea repens	trailing arbutus		WL	
Chamaesyce polygonifolia	chamésyce à feuilles de renouée, seaside sandmat, seaside spurge		SR	Foredune complex
Fuirena pumila	dwarf umbrella-sedge, dwarf umbrellasedge		ST	
Geranium bicknellii	Bicknell's cranesbill, northern crane's-bill		SE	

Species Name	Common Name	Federal	State	INDU Locations/Notes
Lipocarpha micrantha	dwarf bulrush, lipocarphe à petites fleurs, small-flower halfchaff sedge, smallflower halfchaff sedge, smallflower hemicarpha		SE	
Hudsonia tomentosa	hudsonie tomenteuse, sand golden-heather, sand-heather, woolly beachheather		ST	
Juncus balticus var. *littoralis*	Baltic rush		SR	
Juncus pelocarpus	brownfruit rush		SE	
Juncus scirpoides	needlepod rush		ST	
Juniperus communis var. *depressa*	common juniper		SR	Dune complex, foredune complex
Lathyrus japonicus var. *maritimus*	beach pea		SE	
Linum striatum	ridged yellow flax, rigid flax		WL	
Ludwigia sphaerocarpa	globefruit primrose-willow, globefruit primrosewillow		SE	
Lycopodiella inundata	inundated clubmoss		SE	
Myriophyllum pinnatum	cut-leaf water-milfoil, cutleaf watermilfoil, green parrotfeather		SE	
Myriophyllum verticillatum	whorl-leaf watermilfoil, whorled water-milfoil, whorlleaf milfoil, whorlleaf watermilfoil		SR	
Najas gracillima	slender waternymph		ST	
Orobanche fasciculata	clustered broom-rape, clustered broomrape, purple broomrape, tufted broomrape		SE	
Oryzopsis asperifolia	roughleaf ricegrass, white-grain mountain-rice grass		SE	
Piptatherum pungens	mountain ricegrass		SX	
Piptatherum racemosum			SR	
Pinus banksiana	black pine, gray pine, hudson bay pine, jack pine, scrub pine		SR	Dune complex, foredune complex
Pinus strobus	eastern white pine, eastern white pine, northern white pine, soft pine, weymouth pine, white pine		SR	

Species Name	Common Name	Federal	State	INDU Locations/Notes
Platanthera hyperborea	northern bogorchid, northern green orchid		ST	
Polygala paucifolia	gaywings		SE	
Polygonella articulata	coastal jointweed		SR	Dune complex, foredune complex
Polygonum careyi	carey's smartweed, Carey's smartweed, renouée de Carey		ST	
Polygonum hydropiperoides	swamp smartweed		ST	
Potamogeton pulcher	heartleaf pondweed, spotted pondweed		SE	
Potamogeton pusillus	baby pondweed, small pondweed		WL	
Potamogeton richardsonii	red-head pondweed, Richardson pondweed, Richardson's pondweed		SR	
Potamogeton strictifolius	narrowleaf pondweed, straight-leaf pondweed		ST	
Argentina anserina	silverweed cinquefoil		ST	Foredune complex
Prunus pensylvanica	fire cherry, pin cherry		SR	
Rhynchospora scirpoides	longbeak beaksedge		ST	
Pyrola americana	American wintergreen		SR	
Rhus aromatica var. *arenaria*	fragrant sumac		SR	
Rhynchospora macrostachya	tall horned beaksedge		SR	
Salix cordata	heartleaf willow		ST	Foredune complex
Schoenoplectus hallii	Hall's bulrush		SE	
Scirpus purshianus var. *purshianus*	weakstalk bulrush		SR	
Selaginella rupestris	ledge spike-moss, northern selaginella, rock spikemoss		ST	
Sisyrinchium montanum	mountain blue-eyed grass, mountain blueeyed grass, strict blue-eyed grass, strict blue-eyed-grass		SE	
Solidago ptarmicoides	prairie goldenrod, upland white aster, verge-d'or faux-ptarmica, white flat-top goldenrod		SR	
Solidago simplex var. *gillmanii*	Deam's goldenrod, Rand's goldenrod		ST	Foredune complex, blowouts/ open dunes
Sparganium androcladum	branched bur-reed, branched burreed, branching bur-reed		ST	

Species Name	Common Name	Federal	State	INDU Locations/Notes
Spiranthes magnicamporum	Great Plains ladies'–tresses, Great Plains ladiestresses		SE	
Talinum rugospermum	prairie fameflower		ST	
Utricularia cornuta	horned bladderwort		ST	
Utricularia subulata	zigzag bladderwort		ST	
Zannichellia palustris	horned pondweed, horned poolmat, horned–pondweed		SR	

SOURCE: IDNR (2011); Wilhelm (1990)

Notes:

LT = federally listed threatened
SX = state extirpated
SE = state endangered
ST = state threatened
SR = state rare
SRE = reintroduced
WL = watch list

APPENDIX D3: REACH 3 ENDANGERED, THREATENED, AND RARE PLANT SPECIES LIST

INDIANA COUNTY ENDANGERED, THREATENED AND RARE SPECIES LIST FOR REACH 3 PORTER COUNTY (DUNES ACRES/BAILLY TO PORTAGE LAKEFRONT PARK/OGDEN DUNES)

Species Name	Common Name	Federal	State	INDU Locations
Vascular Plants				
Arctostaphylos uva-ursi	bearberry, bearberry manzanita, kinnikinnick, mealberry		SR	Portage Lakefront Park, located along Burns Ditch. Population in decline
Minuartia michauxii var. *michauxii*	Michaux's stitchwort		SR	Prairie-dry, foredune complex
Aristida longespica var. *geniculata*			SR	
Aristida tuberculosa	seaside threeawn		SR	
Symphyotrichum sericeum	western silver aster		SR	
Carex aurea	golden sedge, golden-fruit sedge		SR	
Carex eburnea	bristle-leaf sedge, bristleleaf sedge		SR	
Carex garberi	elk sedge, Garber's sedge		ST	
Chimaphila umbellata ssp. cisatlantica	pipsissewa		ST	
Cirsium pitcheri	Pitcher's thistle, sand dune thistle	LT	ST	Confined to blowout at Bailly
Cornus rugosa	round-leaf dogwood, roundleaf dogwood		SR	
Cyperus houghtonii	Houghton's flatsedge		SE	
Dichanthelium portoricense	Hemlock Witchgrass		SR	
Diervilla lonicera	northern bush honeysuckle, northern bush-honeysuckle		SR	
Drosera intermedia	spoonleaf sundew		SR	
Eleocharis melanocarpa	blackfruit spikerush		ST	
Epigaea repens	trailing arbutus		WL	
Chamaesyce polygonifolia	chamésyce à feuilles de renouée, seaside sandmat, seaside spurge		SR	Foredune complex
Fuirena pumila	dwarf umbrella-sedge, dwarf umbrellasedge		ST	
Geranium bicknellii	Bicknell's cranesbill, northern crane's-bill		SE	

Species Name	Common Name	Federal	State	INDU Locations
Lipocarpha micrantha	dwarf bulrush, lipocarphe à petites fleurs, small-flower halfchaff sedge, smallflower halfchaff sedge, smallflower hemicarpha		SE	
Hudsonia tomentosa	hudsonie tomenteuse, sand golden-heather, sand-heather, woolly beachheather		ST	
Juncus balticus var. *littoralis*	Baltic rush		SR	
Juncus pelocarpus	brownfruit rush		SE	
Juncus scirpoides	needlepod rush		ST	
Juniperus communis var. *depressa*	common juniper		SR	Dune complex, foredune complex
Lathyrus japonicus var. *maritimus*	beach pea		SE	
Linum striatum	ridged yellow flax, rigid flax		WL	
Ludwigia sphaerocarpa	globefruit primrose-willow, globefruit primrosewillow		SE	
Lycopodiella inundata	inundated clubmoss		SE	
Myriophyllum pinnatum	cut-leaf water-milfoil, cutleaf watermilfoil, green parrotfeather		SE	
Myriophyllum verticillatum	whorl-leaf watermilfoil, whorled water-milfoil, whorlleaf milfoil, whorlleaf watermilfoil		SR	
Najas gracillima	slender waternymph		ST	
Orobanche fasciculata	clustered broom-rape, clustered broomrape, purple broomrape, tufted broomrape		SE	
Oryzopsis asperifolia	roughleaf ricegrass, white-grain mountain-rice grass		SE	
Piptatherum pungens	mountain ricegrass		SX	
Piptatherum racemosum			SR	Unique to West Beach
Pinus banksiana	black pine, gray pine, hudson bay pine, jack pine, scrub pine		SR	Dune complex, foredune complex
Pinus strobus	eastern white pine, eastern white pine, northern white pine, soft pine, weymouth pine, white pine		SR	

Species Name	Common Name	Federal	State	INDU Locations
Platanthera hyperborea	northern bogorchid, northern green orchid		ST	
Polygala paucifolia	gaywings		SE	
Polygonella articulata	coastal jointweed		SR	Dune complex, foredune complex
Polygonum careyi	carey's smartweed, Carey's smartweed, renouée de Carey		ST	
Polygonum hydropiperoides	swamp smartweed		ST	
Potamogeton pulcher	heartleaf pondweed, spotted pondweed		SE	
Potamogeton pusillus	baby pondweed, small pondweed		WL	
Potamogeton richardsonii	red-head pondweed, Richardson pondweed, Richardson's pondweed		SR	
Potamogeton strictifolius	narrowleaf pondweed, straight-leaf pondweed		ST	
Argentina anserina	silverweed cinquefoil		ST	Foredune complex
Prunus pensylvanica	fire cherry, pin cherry		SR	
Rhynchospora scirpoides	longbeak beaksedge		ST	
Pyrola americana	American wintergreen		SR	
Rhus aromatica var. *arenaria*	fragrant sumac		SR	
Rhynchospora macrostachya	tall horned beaksedge		SR	
Salix cordata	heartleaf willow		ST	Foredune complex
Schoenoplectus hallii	Hall's bulrush		SE	
Scirpus purshianus var. *purshianus*	weakstalk bulrush		SR	
Selaginella rupestris	ledge spike-moss, northern selaginella, rock spikemoss		ST	
Sisyrinchium montanum	mountain blue-eyed grass, mountain blueeyed grass, strict blue-eyed grass, strict blue-eyed-grass		SE	
Solidago ptarmicoides	prairie goldenrod, upland white aster, verge-d'or faux-ptarmica, white flat-top goldenrod		SR	
Solidago simplex var. *gillmanii*	Deam's goldenrod, Rand's goldenrod		ST	Foredune complex, blowouts/open dunes, Portage Lakefront Park population
Sparganium androcladum	branched bur-reed, branched burreed, branching bur-reed		ST	

Species Name	Common Name	Federal	State	INDU Locations
Spiranthes magnicamporum	Great Plains ladies'-tresses, Great Plains ladiestresses		SE	
Talinum rugospermum	prairie fameflower		ST	
Utricularia cornuta	horned bladderwort		ST	
Utricularia subulata	zigzag bladderwort		ST	
Zannichellia palustris	horned pondweed, horned poolmat, horned-pondweed		SR	
Selaginella apoda	meadow spike-moss, meadow spikemoss, sélaginelle apode		WL	
Shepherdia canadensis	russet buffalo-berry, russet buffaloberry		SX	
Triantha glutinosa	sticky tofieldia		SR	

SOURCE: IDNR (2011); Wilhelm (1990)

Notes:

LT = federally listed threatened
SX = state extirpated
SE = state endangered
ST = state threatened
SR = state rare
SRE = reintroduced
WL = watch list

APPENDIX D4: REACH 4 ENDANGERED, THREATENED, AND RARE PLANT SPECIES LIST

INDIANA COUNTY ENDANGERED, THREATENED AND RARE SPECIES LIST FOR REACH 4 PORTER AND LAKE COUNTIES (WEST BEACH TO MILLER UNIT)

Species Name	Common Name	Federal	State	INDU locations/Notes
Vascular Plants				
Agalinis skinneriana	Skinner's false foxglove		ST	
Arctostaphylos uva-ursi	bearberry, bearberry manzanita, kinnikinnick, mealberry		SR	
Minuartia michauxii var. *michauxii*	Michaux's stitchwort		SR	Prairie-dry, foredune complex
Aristida longespica var. *geniculata*			SR	
Aristida tuberculosa	seaside threeawn		SR	
Symphyotrichum sericeum	western silver aster		SR	
Carex aurea	golden sedge, golden-fruit sedge		SR	Unique to Miller unit
Carex crawei	crawe sedge, Crawe's sedge		ST	
Carex eburnea	bristle-leaf sedge, bristleleaf sedge		SR	Unique to West Beach
Carex garberi	elk sedge, Garber's sedge		ST	
Ceanothus herbaceus	céanothe à feuilles étroites, inland ceanothus, Jersey tea, prairie redroot		SE	
Chimaphila umbellata ssp. cisatlantica	pipsissewa		ST	Extremely rare at West Beach
Cirsium pitcheri	Pitcher's thistle, sand dune thistle	LT	ST	Foredune complex, confined to blowouts
Cornus rugosa	round-leaf dogwood, roundleaf dogwood		SR	
Corydalis sempervirens	rock harlequin		ST	
Cyperus houghtonii	Houghton's flatsedge		SE	
Dichanthelium portoricense	Hemlock Witchgrass		SR	
Diervilla lonicera	northern bush honeysuckle, northern bush-honeysuckle		SR	
Drosera intermedia	spoonleaf sundew		SR	
Eleocharis microcarpa	smallfruit spikerush			Unique to West Beach
Eleocharis melanocarpa	blackfruit spikerush		ST	Unique to West Beach
Epigaea repens	trailing arbutus		WL	

Species Name	Common Name	Federal	State	INDU locations/Notes
Equisetum variegatum	variegated horsetail, variegated scouring-rush, variegated scouringrush		SE	Unique to Miller unit
Chamaesyce polygonifolia	chamésyce à feuilles de renouée, seaside sandmat, seaside spurge		SR	Foredune complex, declining in beach area throughout
Fuirena pumila	dwarf umbrella-sedge, dwarf umbrellasedge		ST	
Geranium bicknellii	Bicknell's cranesbill, northern crane's-bill		SE	
Glyceria borealis	northern mannagrass, small floating manna grass, small floating mannagrass		SE	
Lipocarpha micrantha	dwarf bulrush, lipocarphe à petites fleurs, small-flower halfchaff sedge, smallflower halfchaff sedge, smallflower hemicarpha		SE	
Hudsonia tomentosa	hudsonie tomenteuse, sand golden-heather, sand-heather, woolly beachheather		ST	
Juncus balticus var. *littoralis*	Baltic rush		SR	
Juncus pelocarpus	brownfruit rush		SE	
Juncus scirpoides	needlepod rush		ST	
Juniperus communis var. *depressa*	common juniper		SR	Dune complex, foredune complex
Lathyrus japonicus var. *maritimus*	beach pea		SE	
Linum striatum	ridged yellow flax, rigid flax		WL	
Ludwigia sphaerocarpa	globefruit primrose-willow, globefruit primrosewillow		SE	
Lycopodiella inundata	inundated clubmoss		SE	
Myriophyllum pinnatum	cut-leaf water-milfoil, cutleaf watermilfoil, green parrotfeather		SE	
Myriophyllum verticillatum	whorl-leaf watermilfoil, whorled water-milfoil, whorlleaf milfoil, whorlleaf watermilfoil		SR	Unique to Miller unit
Najas gracillima	slender waternymph		ST	
Oenothera perennis	little evening-primrose		SR	
Orobanche fasciculata	clustered broom-rape, clustered broomrape, purple broomrape, tufted broomrape		SE	

Species Name	Common Name	Federal	State	INDU locations/Notes
Oryzopsis asperifolia	roughleaf ricegrass, white-grain mountain-rice grass		SE	
Piptatherum pungens	mountain ricegrass		SX	
Piptatherum racemosum			SR	Unique to West Beach
Pinus banksiana	black pine, gray pine, hudson bay pine, jack pine, scrub pine		SR	Foredune complex, located around pannes
Pinus strobus	eastern white pine, eastern white pine, northern white pine, soft pine, weymouth pine, white pine		SR	
Platanthera hyperborea	northern bogorchid, northern green orchid		ST	
Platanthera lacera	green fringed orchid		WL	
Polygala paucifolia	gaywings		SE	
Polygonella articulata	coastal jointweed		SR	Dune complex, foredune complex
Polygonum careyi	carey's smartweed, Carey's smartweed, renouée de Carey		ST	
Polygonum hydropiperoides	swamp smartweed		ST	
Potamogeton pulcher	heartleaf pondweed, spotted pondweed		SE	Unique to Miller unit
Potamogeton pusillus	baby pondweed, small pondweed		WL	
Potamogeton richardsonii	red-head pondweed, Richardson pondweed, Richardson's pondweed		SR	
Potamogeton robbinsii	Robbins pondweed, Robbins' pondweed		SR	
Potamogeton strictifolius	narrowleaf pondweed, straight-leaf pondweed		ST	
Argentina anserina	silverweed cinquefoil		ST	Foredune complex
Dasiphora floribunda	shrubby cinquefoil			Unique to Miller unit (pannes)
Prunus pensylvanica	fire cherry, pin cherry		SR	
Rhynchospora scirpoides	longbeak beaksedge		ST	
Pyrola americana	American wintergreen		SR	
Rhus aromatica var. *arenaria*	fragrant sumac		SR	
Rhynchospora macrostachya	tall horned beaksedge		SR	
Rubus flagellaris	northern dewberry, whiplash dewberry		SE	
Salix cordata	heartleaf willow		ST	Foredune complex

Species Name	Common Name	Federal	State	INDU locations/Notes
Clinopodium arkansanum	limestone calamint		SE	
Schoenoplectus hallii	Hall's bulrush		SE	
Scirpus purshianus var. *purshianus*	weakstalk bulrush		SR	
Selaginella apoda	meadow spike-moss, meadow spikemoss, sélaginelle apode		WL	
Selaginella rupestris	ledge spike-moss, northern selaginella, rock spikemoss		ST	
Shepherdia canadensis	russet buffalo-berry, russet buffaloberry		SX	
Sisyrinchium montanum	mountain blue-eyed grass, mountain blueeyed grass, strict blue-eyed grass, strict blue-eyed-grass		SE	
Solidago ptarmicoides	prairie goldenrod, upland white aster, verge-d'or faux-ptarmica, white flat-top goldenrod		SR	
Solidago simplex var. *gillmanii*	Deam's goldenrod, Rand's goldenrod		ST	Foredune complex, blowouts/open dunes
Sparganium androcladum	branched bur-reed, branched burreed, branching bur-reed		ST	
Spiranthes magnicamporum	Great Plains ladies'-tresses, Great Plains ladiestresses		SE	
Talinum rugospermum	prairie fameflower		ST	
Triantha glutinosa	sticky tofieldia		SR	
Utricularia cornuta	horned bladderwort		ST	
Utricularia subulata	zigzag bladderwort		ST	
Zannichellia palustris	horned pondweed, horned poolmat, horned-pondweed		SR	

SOURCE: IDNR (2011); Wilhelm (1990)

Notes:

LT = federally listed threatened
LE = federally listed endangered
SX = state extirpated
SE = state endangered
ST = state threatened
SR = state rare
SRE = reintroduced
WL = watch list

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
Listed Endangered, Threatened and Rare												
Lathyrus japonicus glaber	*Lathyrus japonicus* var. *maritimus*	Jul	Foredune complex	Endangered		beach pea	beach pea	Vine	Perennial	Fabaceae	Dicot	Native
Arctostaphylos uva-ursi coactilis	*Arctostaphylos uva-ursi*	Apr May Jun	Foredune complex, dune complex	Rare		bearberry	bearberry, bearberry manzanita, kinnikinnick, mealberry	Shrub	Perennial	Ericaceae	Dicot	Native
Arenaria stricta	*Minuartia michauxii* var. *michauxii*	May Jun Jul	Prairie dry, foredune complex	Rare		stiff sandwort	Michaux's stitchwort	Forb	Annual, Perennial	Caryophyllaceae	Dicot	Native
Euphorbia polygonifolia	*Chamaesyce polygonifolia*	Jul Aug Sep	Foredune complex	Rare		seaside spurge	chamésyce à feuilles de renouée, seaside sandmat, seaside spurge	Forb	Annual	Euphorbiaceae	Dicot	Native
Juniperus communis depressa	*Juniperus communis* var. *depressa*		Dune complex, foredune complex	Rare		common juniper	common juniper	Shrub	Perennial	Cupressaceae	Gymnosperm	Native
Pinus banksiana	*Pinus banksiana*		Dune complex, foredune complex	Rare		jack pine	black pine, gray pine, hudson bay pine, jack pine, scrub pine	Tree	Perennial	Pinaceae	Gymnosperm	Native
Polygonella articulata	*Polygonella articulata*	Aug Sep Oct	Dune complex, foredune complex	Rare		jointweed	coastal jointweed	Forb	Annual	Polygonaceae	Dicot	Native

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
Rhus aromatica var arenaria	*Rhus aromatica* var. *arenaria*		Foredune complex, savanna complex	Rare		fragrant sumac	fragrant sumac	Shrub	Perennial	Anacardiaceae	Dicot	Native
Cirsium pitcheri	*Cirsium pitcheri*	Jun Jul	Foredune complex	Threatened	Threatened	sand thistle	Pitcher's thistle, sand dune thistle	Forb	Perennial	Asteraceae	Dicot	Native
Potentilla anserina	*Argentina anserina*	May Jun Jul Aug Sep	Foredune complex	Threatened		silverweed	silverweed cinquefoil	Forb	Perennial	Rosaceae	Dicot	Native
Salix syrticola(FC) indiana–Cordata	*Salix cordata*	Apr May Jun Jul	Foredune complex	Threatened		dune willow	heartleaf willow	Shrub	Perennial	Salicaceae	Dicot	Native
Solidago racemosa gillmani	*Solidago simplex* var. *gillmanii*	Jul Aug Sep Oct Nov	Pannes, foredune complex	Threatened		dune goldenrod	Deam's goldenrod, Rand's goldenrod	Forb	Perennial	Asteraceae	Dicot	Native

Source: IDNR (2011); Wilhelm (1990)

APPENDIX D6: PANNE WETLAND SPECIES TABLE

INDU LIST OF PANNE WETLAND SPECIES OBSERVED IN THE EARLY 2000S IN NUTRIENT POOR SAND BASED WETLANDS AT WEST BEACH; OGDEN DUNES; MILLER APRIL 2011

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
West Beach		
Acer rubrum	*Acer rubrum*	red maple
Agalinis purpurea	*Agalinis purpurea*	purple false foxglove
Ailanthus altissima	*Ailanthus altissima*	ailanthus, copal tree, tree of heaven, tree-of-heaven
Amaranthus hybridus	*Amaranthus hybridus*	green pigweed, slim amaranth, smooth amaranth, smooth pigweed
Ambrosia artemisiifolia	*Ambrosia artemisiifolia*	annual ragweed, common ragweed, low ragweed, ragweed, Roman wormwood, short ragweed, small ragweed
Amelanchier sp. *(A. arborea/A. laevis)*	*Amelanchier* sp. *(A. arborea/A. laevis)*	serviceberry
Ammophila breviligulata	*Ammophila breviligulata*	American beachgrass
Andropogon scoparius	*Schizachyrium scoparium*	little bluestem
Anemone cylindrica	*Anemone cylindrica*	candle anemone, cottonweed
Arabis lyrata	*Arabis lyrata*	lyrate rockcress
Arctostaphylos uva-ursi coactilis	*Arctostaphylos uva-ursi*	bearberry, bearberry manzanita, kinnikinnick, mealberry
Aristida intermedia	*Aristida longespica var. geniculata*	slimspike threeawn
Aristida purpurascens	*Aristida purpurascens*	arrowfeather threeawn
Aristida tuberculosa	*Aristida tuberculosa*	seaside threeawn
Artemisia caudata	*Artemisia campestris* ssp. *caudata*	field sagewort, field wormwood, Pacific wormwood
Asclepias incarnata	*Asclepias incarnata*	rose milkweed, swamp milkweed
Asclepias syriaca	*Asclepias syriaca*	broadleaf milkweed, common milkweed
Asclepias verticillata	*Asclepias verticillata*	eastern whorled milkweed, whorled milkweed
Aster dumosus	*Symphyotrichum dumosum*	rice button aster
Aster lateriflorus	*Symphyotrichum lateriflorum*	calico aster
Aster novae-angliae	*Symphyotrichum novae-angliae*	New England aster
Aster ptarmicoides (Solidago ptarmicoides)	*Solidago ptarmicoides*	prairie goldenrod, upland white aster, verge-d'or faux-ptarmica, white flat-top goldenrod
Aster simplex	*Symphyotrichum lanceolatum*	white panicle aster
Berberis thunbergii	*Berberis thunbergii*	Japanese barberry
Bidens spp.	*Bidens spp.*	beggartick, beggarticks, devil's sticktight, Spanish needles
Cakile edentula	*Cakile edentula*	American searocket
Calamagrostis canadensis	*Calamagrostis canadensis*	bluejoint, bluejoint reedgrass
Calamovilfa longifolia	*Calamovilfa longifolia var. magna*	prairie sandreed

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Campylium sp. *(moss)*	*Campylium* sp.	campylium moss
Carex garberi	*Carex garberi*	elk sedge, Garber's sedge
Carex viridula	*Carex viridula*	green sedge, little green sedge
Celastrus orbiculatus	*Celastrus orbiculatus*	Asian bittersweet, Asiatic bittersweet, oriental bittersweet, tsuru-ume-mo-doki
Cephalanthus occidentalis	*Cephalanthus occidentalis*	buttonbush, common buttonbush
Chara spp.	*Chara spp.*	muskgrass, stonewort, muskwort
Cirsium arvense	*Cirsium arvense*	Californian thistle, Canada thistle, Canadian thistle, creeping thistle, field thistle
Cladium mariscoides	*Cladium mariscoides*	smooth sawgrass
Corispermum hyssopifolium	*Corispermum americanum*	American bugseed
Cornus obliqua	*Cornus obliqua*	silky dogwood
Cornus stolonifera	*Cornus sericea*	redosier, redosier dogwood
Cotoneaster sp. *(C. acutifolia?)*	*Cotoneaster* sp. *(C. acutifolius?)*	cononeaster (Peking cotoneaster?)
Cycloloma atriplicifolium	*Cycloloma atriplicifolium*	tumble ringwing, winged pigweed, winged-pigweed
Cyperus erythrorhizos	*Cyperus erythrorhizos*	red-root flat sedge, redroot flatsedge, redroot nutgrass
Cyperus ferruginescens	*Cyperus odoratus*	fragrant flatsedge, rusty flat sedge
Cyperus rivularis	*Cyperus bipartitus*	brook flatsedge, shining flat sedge, slender flatsedge
Cyperus strigosus	*Cyperus strigosus*	stawcolored flatsedge, strawcolor flatsedge, strawcolor nutgrass, strawcolored flatsedge, strawcolored nutgrass
Daucus carota	*Daucus carota*	bird's nest, Queen Anne's lace, wild carrot
Dryopteris thelypteris / T. palustris	*Thelypteris palustris var. pubescens*	eastern marsh fern
Echinochloa crusgalli	*Echinochloa crus-galli*	barnyard grass, barnyardgrass, cockspur, Japanese millet, large barnyard grass, watergrass
Eleocharis compressa	*Eleocharis compressa*	flat-stem spike-rush, flatstem spikerush, flatstemmed spikesedge
Eleocharis elliptica	*Eleocharis elliptica*	elliptic spikerush
Eleocharis geniculata	*Eleocharis geniculate*	Canada spikesedge
Eleocharis olivacea	*Eleocharis flavescens var. olivacea*	bright green spikerush
Eleocharis pauciflora	*Eleocharis quinqueflora*	few-flower spike-rush, few-flower spikerush, fewflower spikerush, fewflowered spikesedge
Epilobium coloratum	*Epilobium coloratum*	purple-leaf willowherb, purpleleaf willowherb, willowweed
Equisetum hyemale	*Equisetum hyemale*	horsetail, scouring horsetail, scouringrush, scouringrush horsetail, tall scouring-rush, western scouringrush
Equisetum variegatum	*Equisetum variegatum*	variegated horsetail, variegated scouring-rush, variegated scouringrush
Equisetum x ferrissii	*Equisetum x ferrissii*	ferris horsetail, Ferriss' horsetail

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Eragrostis spectabilis	*Eragrostis spectabilis*	petticoat-climber, purple lovegrass
Erechtites hieracifolia	*Erechtites hieraciifolius*	American burnweed, burnweed
Erigeron canadensis	*Conyza Canadensis*	Canada horseweed, Canadian horseweed, horseweed, horseweed fleabane, mares tail, marestail
Eupatorium altissimum	*Eupatorium altissimum*	tall joepyeweed, tall thoroughwort
Eupatorium maculatum	*Eutrochium maculatum*	eupatoire maculée, spotted joepyeweed
Eupatorium perfoliatum	*Eupatorium perfoliatum*	boneset, Chapman's thoroughwort, common boneset
Eupatorium serotinum	*Eupatorium serotinum*	late eupatorium, lateflowering thoroughwort
Euphorbia corollata	*Euphorbia corollata*	flowering spurge, floweringspurge euphorbia
Fragaria virginiana	*Fragaria virginiana*	thickleaved wild strawberry, Virginia strawberry, wild strawberry
Fraxinus sp.	*Fraxinus* sp.	ash
Galium pilosum	*Galium pilosum*	hairy bedstraw
Gentiana crinita	*Gentianopsis crinita*	fringed gentian, greater fringed gentian, greater fringed-gentian
Gnaphalium sp.	*Pseudognaphalium* sp.	cudweed, false cudweed, pseudognaphalium
Habenaria hyperborea	*Platanthera hyperborea*	northern bogorchid, northern green orchid
Helianthus petiolaris	*Helianthus petiolaris*	prairie sunflower, showy sunflower
Hypericum kalmianum	*Hypericum kalmianum*	kalm's st. john's-wort, Kalm's St. Johnswort, millepertuis de Kalm
Juncus alpinus	*Juncus alpinoarticulatus*	northern green rush
Juncus articulatus	*Juncus articulatus*	jointed rush, jointleaf rush
Juncus balticus	*Juncus balticus var. littoralis*	Baltic rush
Juncus brachycephalus	*Juncus brachycephalus*	small-head rush, smallhead rush
Juncus nodosus	*Juncus nodosus*	jointed rush, knotted rush
Juncus torreyi	*Juncus torreyi*	torrey rush, Torrey's rush
Juniperus communis	*Juniperus communis var. depressa*	common juniper
Juniperus virginiana	*Juniperus virginiana*	eastern red-cedar, eastern redcedar, genévrier rouge, red cedar juniper
Leersia oryzoides	*Leersia oryzoides*	rice cut grass, rice cutgrass
Liatris aspera	*Liatris aspera*	rough gayfeather, tall blazing star, tall gayfeather
Linum medium	*Linum medium var. texanum*	stiff yellow flax, sucker flas
Linum striatum	*Linum striatum*	ridged yellow flax, rigid flax
Liparis loeselii	*Liparis loeselii*	yellow wide-lip orchid, yellow widelip orchid
Lobelia kalmii	*Lobelia kalmii*	brook lobelia, Ontario lobelia
Lonicera sp.	*Lonicera* sp.	honeysuckle
Lycopus americanus	*Lycopus americanus*	American bugleweed, American water horehound, American waterhorehound, cut-leaf water-horehound, water horehound, waterhorehound
Lycopus uniflorus	*Lycopus uniflorus*	bugleweed, northern bugleweed, northern water-horehound, oneflower bugleweed

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Lythrum salicaria	*Lythrum salicaria*	purple loosestrife, purple loosestrife or lythrum, purple lythrum, rainbow weed, salicaire, spiked loosestrife
Mahonia repens	*Mahonia repens*	creeping barberry, creeping mahonia, oregon grape, Oregongrape, trunkee barberry
Maianthemum canadense interius	*Maianthemum canadense*	Canada mayflower, false lily-of-the-valley, twoleaved Solomonseal
Melilotus alba	*Melilotus alba*	white sweetclover
Morus alba (often just seedlings)	*Morus alba*	mulberry, white mulberry
Oenothera biennis	*Oenothera biennis*	common evening primrose, common evening-primrose, common eveningprimrose, evening primrose (common), hoary eveningprimrose, king's-cureall
Opuntia humifusa	*Opuntia humifusa*	devil's-tongue, Nopal del este, pricklypear
Panicum capillare	*Panicum capillare*	annual witchgrass, common panic grass, common witchgrass, panicgrass, ticklegrass, tumble panic, tumbleweed grass, witches hair, witchgrass
Panicum implicatum	*Dichanthelium acuminatum var. acuminatum*	tapered rosette grass
Panicum virgatum	*Panicum virgatum*	old switch panic grass, switchgrass
Parthenocissus quinquefolia	*Parthenocissus quinquefolia*	American ivy, fiveleaved ivy, Virginia creeper, woodbine
Phalaris arundinacea	*Phalaris arundinacea*	reed canary grass, reed canarygrass
Phragmites australis	*Phragmites australis*	common reed
Pinus banksiana	*Pinus banksiana*	black pine, gray pine, hudson bay pine, jack pine, scrub pine
Plantago rugelii	*Plantago rugelii*	black-seed plantain, blackseed plantain, Rugel's plantain
Poa compressa	*Poa compressa*	Canada bluegrass, flat-stem blue grass
Pogonia ophioglossoides	*Pogonia ophioglossoides*	snake-mouth orchid, snakemouth orchid
Polygonum hydropiperoides	*Polygonum hydropiperoides*	swamp smartweed
Polygonum lapathifolium	*Polygonum lapathifolium*	curltop ladysthumb, curlytop knotweed, curlytop smartweed, dock-leaf smartweed, nodding smartweed, pale smartweed, smartweed
Polygonum pensylvanicum	*Polygonum pensylvanicum*	Pennsylvania knotweed, Pennsylvania smartweed, pinkweed, pinweed
Polygonum persicaria	*Polygonum persicaria*	lady's-thumb, ladysthumb, ladysthumb smartweed, smartweed, spotted knotweed, spotted ladysthumb, spotted smartweed
Polygonum punctatum	*Polygonum punctatum*	dotted smartweed
Populus deltoides	*Populus deltoides*	common cottonwood, cottonwood, eastern cottonwood, plains cottonwood

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Potamogeton sp. *(P. div.,gram.,ill.)*	*Potamogeton* sp. *(P. diversifolius; P. gramineus; P. illinoensis)*	pondweed (waterthread, waterthread pondweed; grassy pondweed, variableleaf pondweed; illinois pondweed, Illinois pondweed, potamot de l'Illinois)
Potentilla anserina	*Argentina anserina*	silverweed cinquefoil
Potentilla simplex	*Potentilla simplex*	common cinquefoil, oldfield cinquefoil, oldfield fivefingers, spreading cinquefoil
Proserpinaca palustris crebra	*Proserpinaca palustris var. crebra*	marsh mermaidweed
Prunus pumila	*Prunus pumila*	sand cherry, sandcherry
Prunus virginiana	*Prunus virginiana*	chokecherry, chokecherry (common), common chokecherry, Virginia chokecherry
Ptelea trifoliata	*Ptelea trifoliata var. mollis*	common hoptree
Quercus velutina	*Quercus velutina*	black oak
Rhamnus frangula	*Frangula alnus*	glossy buckthorn
Rhus aromatica	*Rhus aromatica var. arenaria*	fragrant sumac
Rhus typhina	*Rhus hirta*	staghorn sumac
Rhynchospora capillacea	*Rhynchospora capillacea*	horned beakrush, needle beaksedge
Robinia pseudoacacia	*Robinia pseudoacacia*	black locust, false acacia, yellow locust
Rubus sp. *(seedlings)*	*Rubus* sp.	blackberry, brambles, framboises, ronces
Rudbeckia hirta	*Rudbeckia hirta*	black-eyed Susan, blackeyed Susan
Sabatia angularis	*Sabatia angularis*	rosepink, squarestem rosegentian
Salix fragilis	*Salix fragilis*	crack willow
Salix glaucophylloides	*Salix myricoides var. myricoides*	bayberry willow
Salix interior	*Salix interior*	sandbar willow
Salix syrticola	*Salix cordata*	heartleaf willow
Salsola kali	*Salsola kali*	prickly Russian thistle, Russian thistle, tumbleweed
Sassafras albidum	*Sassafras albidum*	sassafras
Scirpus acutus	*Schoenoplectus acutus var. acutus*	hardstem bulrush, Tule bulrush
Scirpus pungens (S. amer.)	*Schoenoplectus pungens var. pungens*	common threesquare
Scirpus validus	*Schoenoplectus tabernaemontani*	great bulrush, soft-stem bulrush, softstem bulrush
Scleria verticillata	*Scleria verticillata*	low nutrush
Scutellaria lateriflora	*Scutellaria lateriflora*	blue skullcap, mad dog skullcap
Senecio pauperculus	*Packera paupercula*	balsam groundsel
Silene cucubalus	*Silene vulgaris*	bladder campion, bladder silene, cowbell, maiden's tears, maiden's-tears, maidenstears, rattleweed
Smilacina stellata	*Maianthemum stellatum*	false Solomon's seal, little false Solomon's-seal, star false Solomon's-seal, star-flower Solomon's-seal, starry false lily of the valley, starry false Solomon's seal, starry false Solomon's-seal, starry Solomon's-seal

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Solanum dulcamara	*Solanum dulcamara*	bitter nightshade, bittersweet nightshade, blue nightshade, climbing nightshade, European bittersweet, fellenwort, woody nightshade
Solidago altissima	*Solidago altissima* ssp. *altissima*	Canada goldenrod, late goldenrod
Solidago caesia	*Solidago caesia*	wreath goldenrod
Solidago gigantea	*Solidago gigantea*	giant goldenrod
Solidago graminifolia	*Euthamia graminifolia*	flat-top goldentop, flattop goldentop, slender goldentop
Solidago nemoralis	*Solidago nemoralis*	dyersweed goldenrod, gray goldenrod
Solidago racemosa	*Solidago simplex var. gillmanii*	Deam's goldenrod, Rand's goldenrod
Solidago rugosa	*Solidago rugosa*	wrinkleleaf goldenrod
Sonchus sp.	*Sonchus* sp.	sow thistle, sowthistle
Sonchus uliginosus	*Sonchus arvensis* ssp. *uliginosus*	field sow-thistle, field sowthistle, marsh sowthistle, moist sowthistle, perennial sowthistle, sowthistle
Spiranthes cernua	*Spiranthes cernua*	nodding ladies'-tresses, nodding ladiestresses, white nodding ladies'-tresses
Taraxacum sp.	*Taraxacum* sp.	dandelion
Thuidium sp. *(fern-moss)*	*Thuidium* sp.	thuidium moss
Toxicodendron radicans	*Toxicodendron radicans*	eastern poison ivy, poison ivy, poisonivy
Tradescantia ohiensis	*Tradescantia ohiensis*	bluejacket, Ohio spiderwort
Triglochin maritimum	*Triglochin maritimum*	arrowgrass, seaside arrow-grass, seaside arrowgrass, shore arrowgrass
Typha angustifolia	*Typha angustifolia*	narrow-leaf cat-tail, narrowleaf cattail
Typha x hybrid	*Typha x glauca*	white cattail
Ulmus seedling	*Ulmus* sp.	elm
Utricularia cornuta	*Utricularia cornuta*	horned bladderwort
Utricularia subulata	*Utricularia subulata*	zigzag bladderwort
Verbascum thapsus	*Verbascum thapsus*	big taper, common mullein, flannel mullein, flannel plant, great mullein, mullein, velvet dock, velvet plant, woolly mullein
Verbena hastata	*Verbena hastata*	blue verbena, blue vervain, Simpler's-joy, swamp verbena
Viburnum opulus	*Viburnum opulus var. opulus*	European cranberrybush
Vitis riparia	*Vitis riparia*	river-bank grape, riverbank grape
Yucca smalliana	*Yucca flaccida*	weak-leaf yucca
Miller		
Agalinis purpurea	*Agalinis purpurea*	purple false foxglove
Agrostis alba	*Agrostis gigantea*	black bent, redtop, water bentgrass
Ailanthus altissima	*Ailanthus altissima*	ailanthus, copal tree, tree of heaven, tree-of-heaven
Alisma subcordatum	*Alisma subcordatum*	alisma subcorde, American water plantain, southern water plantain, waterplaintain
Andropogon scoparius	*Schizachyrium scoparium*	little bluestem

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Apocynum sibiricum	*Apocynum cannabinum*	common dogbane, dogbane, hemp dogbane, Indian hemp, Indian-hemp, Indianhemp, prairie dogbane
Arabis lyrata	*Arabis lyrata*	lyrate rockcress
Arctostaphylos uva-ursi coactilis	*Arctostaphylos uva-ursi*	bearberry, bearberry manzanita, kinnikinnick, mealberry
Aristida intermedia	*Aristida longespica var. geniculata*	slimspike threeawn
Artemisia caudata	*Artemisia campestris* ssp. *caudata*	field sagewort, field wormwood, Pacific wormwood
Asclepias incarnata	*Asclepias incarnata*	rose milkweed, swamp milkweed
Asclepias syriaca	*Asclepias syriaca*	broadleaf milkweed, common milkweed
Asparagus officinalis	*Asparagus officinalis*	asparagus, garden asparagus, garden-asparagus
Aster azureus	*Symphyotrichum oolentangiense*	skyblue aster
Aster dumosus	*Symphyotrichum dumosum*	rice button aster
Aster ptarmicoides (Solidago)	*Solidago ptarmicoides*	prairie goldenrod, upland white aster, verge-d'or faux-ptarmica, white flat-top goldenrod
Berberis thunbergii	*Berberis thunbergii*	Japanese barberry
Bidens vulgata	*Bidens vulgata*	big devil's beggartick, tall beggarticks, western sticktight
Calamagrostis canadensis	*Calamagrostis canadensis*	bluejoint, bluejoint reedgrass
Calamovilfa longifolia	*Calamovilfa longifolia var. magna*	prairie sandreed
Carex comosa	*Carex comosa*	longhair sedge
Carex viridula	*Carex viridula*	green sedge, little green sedge
Celastrus orbiculatus	*Celastrus orbiculatus*	Asian bittersweet, Asiatic bittersweet, oriental bittersweet, tsuru-ume-mo-doki
Cephalanthus occidentalis	*Cephalanthus occidentalis*	buttonbush, common buttonbush
Chara spp.	*Chara spp.*	muskgrass, stonewort, muskwort
Cirsium arvense	*Cirsium arvense*	Californian thistle, Canada thistle, Canadian thistle, creeping thistle, field thistle
Cirsium vulgare	*Cirsium vulgare*	bull thistle, common thistle, spear thistle
Cladium mariscoides	*Cladium mariscoides*	smooth sawgrass
Corispermum hyssopifolium	*Corispermum americanum*	American bugseed
Cornus obliqua	*Cornus obliqua*	silky dogwood
Cornus stolonifera	*Cornus sericea*	redosier, redosier dogwood
Cyperus erythrorhizos	*Cyperus erythrorhizos*	red-root flat sedge, redroot flatsedge, redroot nutgrass
Cyperus ferruginescens	*Cyperus odoratus*	fragrant flatsedge, rusty flat sedge
Cyperus rivularis	*Cyperus bipartitus*	brook flatsedge, shining flat sedge, slender flatsedge
Dryopteris thelypteris / T. palustris	*Thelypteris palustris var. pubescens*	eastern marsh fern
Dulichium arundinaceum	*Dulichium arundinaceum*	threeway sedge
Eleocharis compressa	*Eleocharis compressa*	flat-stem spike-rush, flatstem spikerush, flatstemmed spikesedge

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Eleocharis elliptica	*Eleocharis elliptica*	elliptic spikerush
Eleocharis erythropoda	*Eleocharis erythropoda*	bald spike-rush, bald spikerush, spikesedge
Eleocharis olivacea	*Eleocharis flavescens var. olivacea*	bright green spikerush
Epilobium ciliatum	*Epilobium ciliatum*	fringed willowherb, hairy willowherb, hairy willowweed
Equisetum hyemale	*Equisetum hyemale*	horsetail, scouring horsetail, scouringrush, scouringrush horsetail, tall scouring-rush, western scouringrush
Equisetum variegatum	*Equisetum variegatum*	variegated horsetail, variegated scouring-rush, variegated scouringrush
Equisetum x ferrissii	*Equisetum x ferrissii*	ferris horsetail, Ferriss' horsetail
Erechtites hieracifolia	*Erechtites hieraciifolius*	American burnweed, burnweed
Eupatorium altissimum	*Eupatorium altissimum*	tall joepyeweed, tall thoroughwort
Eupatorium maculatum	*Eutrochium maculatum*	eupatoire maculée, spotted joepyeweed
Eupatorium perfoliatum	*Eupatorium perfoliatum*	boneset, Chapman's thoroughwort, common boneset
Eupatorium serotinum	*Eupatorium serotinum*	late eupatorium, lateflowering thoroughwort
Euphorbia corollata	*Euphorbia corollata*	flowering spurge, floweringspurge euphorbia
Fragaria virginiana	*Fragaria virginiana*	thickleaved wild strawberry, Virginia strawberry, wild strawberry
Fraxinus sp.	*Fraxinus* sp.	ash
Gentiana crinita	*Gentianopsis crinita*	fringed gentian, greater fringed gentian, greater fringed-gentian
Hypericum kalmianum	*Hypericum kalmianum*	kalm's st. john's-wort, Kalm's St. Johnswort, millepertuis de Kalm
Hypericum majus	*Hypericum majus*	greater Canadian St. John's-wort, large St Johnswort, large St. Johnswort
Iris virginica	*Iris virginica*	Virginia iris
Juncus alpinus	*Juncus alpinoarticulatus*	northern green rush
Juncus balticus	*Juncus balticus var. littoralis*	Baltic rush
Juncus brachycephalus	*Juncus brachycephalus*	small-head rush, smallhead rush
Juncus canadensis	*Juncus canadensis*	Canadian rush
Juncus nodosus	*Juncus nodosus*	jointed rush, knotted rush
Juniperus communis	*Juniperus communis*	common juniper, dwarf juniper, genévrier commun
Juniperus virginiana	*Juniperus virginiana*	eastern red-cedar, eastern redcedar, genévrier rouge, red cedar juniper
Leersia oryzoides	*Leersia oryzoides*	rice cut grass, rice cutgrass
Lemna sp. *(most likely L. minor)*	*Lemna* sp. *(most likely L. minor)*	duckweed (most likely common duckweed, least duckweed, lesser duckweed)
Liatris aspera	*Liatris aspera*	rough gayfeather, tall blazing star, tall gayfeather
Linum medium	*Linum medium var. texanum*	stiff yellow flax, sucker flas
Linum striatum	*Linum striatum*	ridged yellow flax, rigid flax

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Lithospermum croceum	*Lithospermum caroliniense var. croceum*	Carolina puccoon
Lobelia kalmii	*Lobelia kalmii*	brook lobelia, Ontario lobelia
Lonicera sp.	*Lonicera* sp.	honeysuckle
Lonicera tatarica	*Lonicera tatarica*	bush honeysuckle, Tartarian honeysuckle, Tatarian honeysuckle
Lycopus americanus	*Lycopus americanus*	American bugleweed, American water horehound, American waterhorehound, cut-leaf water-horehound, water horehound, waterhorehound
Lycopus rubellus	*Lycopus rubellus*	taperleaf bugleweed, taperleaf water horehound
Lycopus uniflorus	*Lycopus uniflorus*	bugleweed, northern bugleweed, northern water-horehound, oneflower bugleweed
Lythrum alatum	*Lythrum alatum*	wing-angle loosestrife, winged lythrum
Lythrum salicaria	*Lythrum salicaria*	purple loosestrife, purple loosestrife or lythrum, purple lythrum, rainbow weed, salicaire, spiked loosestrife
Mimulus ringens	*Mimulus ringens*	Allegheny monkey-flower, Allegheny monkeyflower, ringen monkeyflower
Muhlenbergia mexicana	*Muhlenbergia mexicana*	Mexican muhly
Nuphar advena	*Nuphar lutea* ssp. *advena*	yellow pond-lily, yellow pondlily
Panicum capillare	*Panicum capillare*	annual witchgrass, common panic grass, common witchgrass, panicgrass, ticklegrass, tumble panic, tumbleweed grass, witches hair, witchgrass
Panicum implicatum	*Dichanthelium acuminatum var. acuminatum*	tapered rosette grass
Panicum virgatum	*Panicum virgatum*	old switch panic grass, switchgrass
Parthenocissus quinquefolia	*Parthenocissus quinquefolia*	American ivy, fiveleaved ivy, Virginia creeper, woodbine
Pedicularis lanceolata	*Pedicularis lanceolata*	swamp lousewort
Phragmites australis	*Phragmites australis*	common reed
Pinus banksiana	*Pinus banksiana*	black pine, gray pine, hudson bay pine, jack pine, scrub pine
Polygonum amphibium	*Polygonum amphibium*	water knotweed, water smartweed
Polygonum hydropiperoides	*Polygonum hydropiperoides*	swamp smartweed
Polygonum lapathifolium	*Polygonum lapathifolium*	curltop ladysthumb, curlytop knotweed, curlytop smartweed, dock-leaf smartweed, nodding smartweed, pale smartweed, smartweed
Polygonum persicaria	*Polygonum persicaria*	lady's-thumb, ladysthumb, ladysthumb smartweed, smartweed, spotted knotweed, spotted ladysthumb, spotted smartweed
Populus deltoides	*Populus deltoides*	common cottonwood, cottonwood, eastern cottonwood, plains cottonwood
Populus tremuloides	*Populus tremuloides*	quaking aspen

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Potamogeton crispus	*Potamogeton crispus*	curly pondweed, curly-leaved pondweed
Potamogeton robbinsii	*Potamogeton robbinsii*	Robbins pondweed, Robbins' pondweed
Potamogeton sp. *(P. div.,gram.,ill.)*	*Potamogeton* sp. *(P. diversifolius; P. gramineus; P. illinoensis)*	pondweed (waterthread, waterthread pondweed; grassy pondweed, variableleaf pondweed; illinois pondweed, Illinois pondweed, potamot de l'Illinois)
Proserpinaca palustris crebra	*Proserpinaca palustris var. crebra*	marsh mermaidweed
Prunus pumila	*Prunus pumila*	sand cherry, sandcherry
Prunus virginiana	*Prunus virginiana*	chokecherry, chokecherry (common), common chokecherry, Virginia chokecherry
Ptelea trifoliata	*Ptelea trifoliata var. mollis*	common hoptree
Pycnanthemum tenuifolium	*Pycnanthemum tenuifolium*	narrowleaf mountainmint, narrowleaf mountianmint
Pycnanthemum virginianum	*Pycnanthemum virginianum*	Virginia mountain-mint, Virginia mountainmint, Virginia mountianmint
Quercus palustris	*Quercus palustris*	pin oak
Quercus velutina	*Quercus velutina*	black oak
Rhus aromatica	*Rhus aromatica var. arenaria*	fragrant sumac
Rhynchospora capillacea	*Rhynchospora capillacea*	horned beakrush, needle beaksedge
Rosa palustris	*Rosa palustris*	swamp rose
Rudbeckia hirta	*Rudbeckia hirta*	black-eyed Susan, blackeyed Susan
Sabatia angularis	*Sabatia angularis*	rosepink, squarestem rosegentian
Salix glaucophylloides	*Salix myricoides var. myricoides*	bayberry willow
Salix interior	*Salix interior*	sandbar willow
Salix nigra	*Salix nigra*	black willow
Salix syrticola	*Salix cordata*	heartleaf willow
Satureja arkansana	*Clinopodium arkansanum*	limestone calamint
Scirpus acutus	*Schoenoplectus acutus var. acutus*	hardstem bulrush, Tule bulrush
Scirpus pungens (S. amer.)	*Schoenoplectus pungens var. pungens*	common threesquare
Scirpus validus	*Schoenoplectus tabernaemontani*	great bulrush, soft-stem bulrush, softstem bulrush
Scleria verticillata	*Scleria verticillata*	low nutrush
Scutellaria epilobifolia	*Scutellaria galericulata*	hooded skullcap, marsh scullcap, marsh skullcap
Senecio pauperculus	*Packera paupercula*	balsam groundsel
Smilacina stellata	*Maianthemum stellatum*	false Solomon's seal, little false Solomon's-seal, star false Solomon's-seal, star-flower Solomon's-seal, starry false lily of the valley, starry false Solomon's seal, starry false Solomon's-seal, starry Solomon's-seal
Solanum dulcamara	*Solanum dulcamara*	bitter nightshade, bittersweet nightshade, blue nightshade, climbing nightshade, European bittersweet, fellenwort, woody nightshade

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Solidago altissima	*Solidago altissima* ssp. *altissima*	Canada goldenrod, late goldenrod
Solidago gigantea	*Solidago gigantea*	giant goldenrod
Solidago graminifolia	*Euthamia graminifolia*	flat-top goldentop, flattop goldentop, slender goldentop
Solidago nemoralis	*Solidago nemoralis*	dyersweed goldenrod, gray goldenrod
Sorghastrum nutans	*Sorghastrum nutans*	Indiangrass, yellow indian-grass
Sphagnum sp.	*Sphagnum* sp.	sphagnum
Spiranthes cernua	*Spiranthes cernua*	nodding ladies'-tresses, nodding ladiestresses, white nodding ladies'-tresses
Toxicodendron radicans	*Toxicodendron radicans*	eastern poison ivy, poison ivy, poisonivy
Triglochin maritimum	*Triglochin maritimum*	arrowgrass, seaside arrow-grass, seaside arrowgrass, shore arrowgrass
Typha angustifolia	*Typha angustifolia*	narrow-leaf cat-tail, narrowleaf cattail
Typha x hybrid	*Typha x glauca*	white cattail
Ulmus pumila	*Ulmus pumila*	Chinese elm, Siberian elm
Utricularia cornuta	*Utricularia cornuta*	horned bladderwort
Utricularia gibba	*Utricularia gibba*	conespur bladderpod, humped bladderwort
Utricularia vulgaris	*Utricularia macrorhiza*	common bladderpod, common bladderwort, greater bladderwort
Vitis riparia	*Vitis riparia*	river-bank grape, riverbank grape
Xanthium strumarium	*Xanthium strumarium*	Canada cocklebur, cocklebur, cockleburr, common cocklebur, rough cocklebur, rough cockleburr
Ogden Dunes		
Agalinis purpurea	*Agalinis purpurea*	purple false foxglove
Ammophila breviligulata	*Ammophila breviligulata*	American beachgrass
Andropogon scoparius	*Schizachyrium scoparium*	little bluestem
Arabis lyrata	*Arabis lyrata*	lyrate rockcress
Arctostaphylos uva-ursi coactilis	*Arctostaphylos uva-ursi*	bearberry, bearberry manzanita, kinnikinnick, mealberry
Artemisia caudata	*Artemisia campestris* ssp. *caudata*	field sagewort, field wormwood, Pacific wormwood
Aster dumosus	*Symphyotrichum dumosum*	rice button aster
Aster ptarmicoides (Solidago)	*Solidago ptarmicoides*	prairie goldenrod, upland white aster, verge-d'or faux-ptarmica, white flat-top goldenrod
Aster simplex	*Symphyotrichum lanceolatum*	white panicle aster
Berberis thunbergii	*Berberis thunbergii*	Japanese barberry
Calamovilfa longifolia	*Calamovilfa longifolia var. magna*	prairie sandreed
Campylium sp. *(moss)*	*Campylium* sp.	campylium moss
Carex viridula	*Carex viridula*	green sedge, little green sedge
Celastrus orbiculatus	*Celastrus orbiculatus*	Asian bittersweet, Asiatic bittersweet, oriental bittersweet, tsuru-ume-mo-doki
Chara spp.	*Chara spp.*	muskgrass, stonewort, muskwort
Cirsium vulgare	*Cirsium vulgare*	bull thistle, common thistle, spear thistle
Cladium mariscoides	*Cladium mariscoides*	smooth sawgrass

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Corispermum hyssopifolium	*Corispermum americanum*	American bugseed
Cornus stolonifera	*Cornus sericea*	redosier, redosier dogwood
Cyperus rivularis	*Cyperus bipartitus*	brook flatsedge, shining flat sedge, slender flatsedge
Daucus carota	*Daucus carota*	bird's nest, Queen Anne's lace, wild carrot
Eleocharis elliptica	*Eleocharis elliptica*	elliptic spikerush
Eleocharis geniculata	*Eleocharis geniculata*	Canada spikesedge
Eleocharis pauciflora	*Eleocharis quinqueflora*	few-flower spike-rush, few-flower spikerush, fewflower spikerush, fewflowered spikesedge
Equisetum variegatum	*Equisetum variegatum*	variegated horsetail, variegated scouring-rush, variegated scouringrush
Equisetum x ferrissii	*Equisetum x ferrissii*	ferris horsetail, Ferriss' horsetail
Erigeron canadensis	*Conyza canadensis*	Canada horseweed, Canadian horseweed, horseweed, horseweed fleabane, mares tail, marestail
Eupatorium perfoliatum	*Eupatorium perfoliatum*	boneset, Chapman's thoroughwort, common boneset
Fimbristylis autumnalis	*Fimbristylis autumnalis*	slender fimbry
Fragaria virginiana	*Fragaria virginiana*	thickleaved wild strawberry, Virginia strawberry, wild strawberry
Gentiana crinita	*Gentianopsis crinita*	fringed gentian, greater fringed gentian, greater fringed-gentian
Helianthus petiolaris	*Helianthus petiolaris*	prairie sunflower, showy sunflower
Hemicarpha micrantha	*Lipocarpha micrantha*	dwarf bulrush, lipocarphe à petites fleurs, small-flower halfchaff sedge, smallflower halfchaff sedge, smallflower hemicarpha
Hypericum kalmianum	*Hypericum kalmianum*	kalm's st. john's-wort, Kalm's St. Johnswort, millepertuis de Kalm
Juncus alpinus	*Juncus alpinoarticulatus*	northern green rush
Juncus balticus	*Juncus balticus var. littoralis*	Baltic rush
Juncus brachycephalus	*Juncus brachycephalus*	small-head rush, smallhead rush
Juncus nodosus	*Juncus nodosus*	jointed rush, knotted rush
Juniperus communis	*Juniperus communis*	common juniper, dwarf juniper, genévrier commun
Juniperus virginiana	*Juniperus virginiana*	eastern red-cedar, eastern redcedar, genévrier rouge, red cedar juniper
Lechea tenuifolia	*Lechea tenuifolia*	narrowleaf pinweed
Lemna sp. *(most likely L. minor)*	*Lemna* sp. *(most likely L. minor)*	duckweed (most likely common duckweed, least duckweed, lesser duckweed)
Lobelia kalmii	*Lobelia kalmii*	brook lobelia, Ontario lobelia
Lycopus americanus	*Lycopus americanus*	American bugleweed, American water horehound, American waterhorehound, cut-leaf water-horehound, water horehound, waterhorehound
Lycopus uniflorus	*Lycopus uniflorus*	bugleweed, northern bugleweed, northern water-horehound, oneflower bugleweed

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Lythrum salicaria	*Lythrum salicaria*	purple loosestrife, purple loosestrife or lythrum, purple lythrum, rainbow weed, salicaire, spiked loosestrife
Mahonia repens	*Mahonia repens*	creeping barberry, creeping mahonia, oregon grape, Oregongrape, trunkee barberry
Morus alba (often just seedlings)	*Morus alba*	mulberry, white mulberry
Nepeta cataria	*Nepeta cataria*	catmint, catnip, catwort, field balm
Oenothera biennis	*Oenothera biennis*	common evening primrose, common evening-primrose, common eveningprimrose, evening primrose (common), hoary eveningprimrose, king's-cureall
Opuntia humifusa	*Opuntia humifusa*	devil's-tongue, Nopal del este, pricklypear
Panicum implicatum	*Dichanthelium acuminatum var. acuminatum*	tapered rosette grass
Panicum virgatum	*Panicum virgatum*	old switch panic grass, switchgrass
Phalaris arundinacea	*Phalaris arundinacea*	reed canary grass, reed canarygrass
Phragmites australis	*Phragmites australis*	common reed
Pinus banksiana	*Pinus banksiana*	black pine, gray pine, hudson bay pine, jack pine, scrub pine
Populus deltoides	*Populus deltoides*	common cottonwood, cottonwood, eastern cottonwood, plains cottonwood
Prunus virginiana	*Prunus virginiana*	chokecherry, chokecherry (common), common chokecherry, Virginia chokecherry
Ptelea trifoliata	*Ptelea trifoliata var. mollis*	common hoptree
Quercus velutina	*Quercus velutina*	black oak
Rhynchospora capillacea	*Rhynchospora capillacea*	horned beakrush, needle beaksedge
Rosa multiflora	*Rosa multiflora*	multiflora rose
Rosa palustris	*Rosa palustris*	swamp rose
Rubus sp. *(seedlings)*	*Rubus* sp.	blackberry, brambles, framboises, ronces
Sabatia angularis	*Sabatia angularis*	rosepink, squarestem rosegentian
Salix discolor	*Salix discolor*	pussy willow
Salix fragilis	*Salix fragilis*	crack willow
Salix glaucophylloides	*Salix myricoides var. myricoides*	bayberry willow
Salix interior	*Salix interior*	sandbar willow
Salsola kali	*Salsola kali*	prickly Russian thistle, Russian thistle, tumbleweed
Sassafras albidum	*Sassafras albidum*	sassafras
Scirpus acutus	*Schoenoplectus acutus var. acutus*	hardstem bulrush, Tule bulrush
Scirpus pungens (S. amer.)	*Schoenoplectus pungens var. pungens*	common threesquare
Scirpus validus	*Schoenoplectus tabernaemontani*	great bulrush, soft-stem bulrush, softstem bulrush
Scleria verticillata	*Scleria verticillata*	low nutrush
Senecio pauperculus	*Packera paupercula*	balsam groundsel

Species	Integrated Taxonomic Information System (ITIS) Name	Common Name
Smilacina stellata	*Maianthemum stellatum*	false Solomon's seal, little false Solomon's-seal, star false Solomon's-seal, star-flower Solomon's-seal, starry false lily of the valley, starry false Solomon's seal, starry false Solomon's-seal, starry Solomon's-seal
Solanum dulcamara	*Solanum dulcamara*	bitter nightshade, bittersweet nightshade, blue nightshade, climbing nightshade, European bittersweet, fellenwort, woody nightshade
Solidago altissima	*Solidago altissima* ssp. *altissima*	Canada goldenrod, late goldenrod
Solidago gigantea	*Solidago gigantea*	giant goldenrod
Solidago graminifolia	*Euthamia graminifolia*	flat-top goldentop, flattop goldentop, slender goldentop
Solidago nemoralis	*Solidago nemoralis*	dyersweed goldenrod, gray goldenrod
Solidago rugosa	*Solidago rugosa*	wrinkleleaf goldenrod
Sonchus uliginosus	*Sonchus arvensis* ssp. *uliginosus*	field sow-thistle, field sowthistle, marsh sowthistle, moist sowthistle, perennial sowthistle, sowthistle
Triglochin maritimum	*Triglochin maritimum*	arrowgrass, seaside arrow-grass, seaside arrowgrass, shore arrowgrass
Typha angustifolia	*Typha angustifolia*	narrow-leaf cat-tail, narrowleaf cattail
Utricularia cornuta	*Utricularia cornuta*	horned bladderwort
Utricularia subulata	*Utricularia subulata*	zigzag bladderwort
Viburnum opulus	*Viburnum opulus var. opulus*	European cranberrybush

SOURCE: Prepared by Daniel Mason, NPS

Note:

For the most part nomenclature follow Flora of Chicago; however a few names may reflect recent changes per the Flora of North America.

APPENDIX D7: PARK PLANTS OF CONCERN AND LIST OF SPECIES OCCURRING IN THE DUNE COMPLEX

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
Listed Endangered, Threatened and Rare												
Lathyrus japonicus glaber	*Lathyrus japonicus* var. *maritimus*	Jul	Foredune complex	Endangered		beach pea	beach pea	Vine	Perennial	Fabaceae	Dicot	Native
Arctostaphylos uva-ursi coactilis	*Arctostaphylos uva-ursi*	Apr May Jun	Foredune complex, dune complex	Rare		bearberry	bearberry, bearberry manzanita, kinnikinnick, mealberry	Shrub	Perennial	Ericaceae	Dicot	Native
Arenaria stricta	*Minuartia michauxii* var. *michauxii*	May Jun Jul	Prairie dry, foredune complex	Rare		stiff sandwort	Michaux's stitchwort	Forb	Annual, Perennial	Caryophyllaceae	Dicot	Native
Euphorbia polygonifolia	*Chamaesyce polygonifolia*	Jul Aug Sep	Foredune complex	Rare		seaside spurge	chamésyce à feuilles de renouée, seaside sandmat, seaside spurge	Forb	Annual	Euphorbiaceae	Dicot	Native
Juniperus communis depressa	*Juniperus communis* var. *depressa*		Dune complex, foredune complex	Rare		common juniper	common juniper	Shrub	Perennial	Cupressaceae	Gymnosperm	Native
Pinus banksiana	*Pinus banksiana*		Dune complex, foredune complex	Rare		jack pine	black pine, gray pine, hudson bay pine, jack pine, scrub pine	Tree	Perennial	Pinaceae	Gymnosperm	Native
Polygonella articulata	*Polygonella articulata*	Aug Sep Oct	Dune complex, foredune complex	Rare		jointweed	coastal jointweed	Forb	Annual	Polygonaceae	Dicot	Native
Rhus aromatica var arenaria	*Rhus aromatica* var. *arenaria*		Foredune complex, savanna complex	Rare		fragrant sumac	fragrant sumac	Shrub	Perennial	Anacardiaceae	Dicot	Native
Cirsium pitcheri	*Cirsium pitcheri*	Jun Jul	Foredune complex	Threatened	Threatened	sand thistle	Pitcher's thistle, sand dune thistle	Forb	Perennial	Asteraceae	Dicot	Native

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
Potentilla anserina	*Argentina anserina*	May Jun Jul Aug Sep	Foredune complex	Threatened		silverweed	silverweed cinquefoil	Forb	Perennial	Rosaceae	Dicot	Native
Salix syrticola(FC) indiana-Cordata	*Salix cordata*	Apr May Jun Jul	Foredune complex	Threatened		dune willow	heartleaf willow	Shrub	Perennial	Salicaceae	Dicot	Native
Solidago racemosa gillmani	*Solidago simplex* var. *gillmanii*	Jul Aug Sep Oct Nov	Pannes, foredune complex	Threatened		dune goldenrod	Deam's goldenrod, Rand's goldenrod	Forb	Perennial	Asteraceae	Dicot	Native
Desirable Beach Plant Assemblage (would also include E. polygonifoilia)												
Arabis lyrata	*Arabis lyrata*	Apr May Jun Jul Aug Sep	Foredune complex, dune complex, savanna complex	No status		sand cress	lyrate rockcress	Forb	Annual	Brassicaceae	Dicot	Native
Artemisia caudata	*Artemisia campestris* ssp. *caudata*	Aug Sep Oct	Foredune complex, dune complex	No status		beach wormwood	field sagewort, field wormwood, Pacific wormwood	Forb	Biennial	Asteraceae	Dicot	Native
Cakile edentula	*Cakile edentula*	Jul Aug Sep Oct	Foredune complex	No status		sea rocket	American searocket	Forb	Annual	Brassicaceae	Dicot	Native
Corispermum hyssopifolium	*Corispermum americanum*	Aug Sep	Foredune complex, dune complex	No status		common bugseed	American bugseed	Forb	Annual	Chenopodiaceae	Dicot	Native
Cycloloma atriplicifolium	*Cycloloma atriplicifolium*	Jul Aug Sep	Foredune complex, dune complex, savanna complex	No status		winged pigweed	tumble ringwing, winged pigweed, winged-pigweed	Forb	Annual	Chenopodiaceae	Dicot	Native

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
List of Species (native and non-native) Occurring in the Beach/Dune Complex (not including wetlands/pannes)												
Ammophila breviligulata	*Ammophila breviligulata*		Foredune complex	No status		marram grass	American beachgrass	Graminoid	Perennial	Poaceae	Monocot	Native
Andropogon scoparius	*Schizachyrium scoparium*		Prairie wet, prairie dry, foredune complex	No status		little bluestem grass	little bluestem	Graminoid	Perennial	Poaceae	Monocot	Native
Asclepias viridiflora	*Asclepias viridiflora*	Jun Jul	Foredune complex, prairie dry, dist dry	No status		short green milkweed	green antelopehorn milkweed, green comet milkweed, green milkweed	Forb	Perennial	Asclepiadaceae	Dicot	Native
Calamovilfa longifolia	*Calamovilfa longifolia* var. *magna*		Dist dry, dune complex, foredune complex	No status		sand reed	prairie sandreed	Graminoid	Perennial	Poaceae	Monocot	Native
Carex tonsa	*Carex tonsa* var. *tonsa*		Foredune complex	No status		sedge	shaved sedge	Graminoid	Perennial	Cyperaceae	Monocot	Native
Carex umbellata	*Carex umbellata*		Foredune complex	No status		hairy false early sedge	parasol sedge	Graminoid	Perennial	Cyperaceae	Monocot	Native
Celastrus orbiculatus	*Celastrus orbiculatus*		Dune complex, savanna complex	No status		oriental bittersweet	Asian bittersweet, Asiatic bittersweet, oriental bittersweet, tsuru-ume-mo-doki	Shrub	Perennial	Celastraceae	Dicot	Non-native
Celastrus scandens	*Celastrus scandens*	May Jun	Dist-dry, Foredune complex, savanna complex	No status		climbing bittersweet	American bittersweet, staffvine, waxwork	Shrub	Perennial	Celastraceae	Dicot	Native

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
Centaurea maculosa	*Centaurea stoebe* ssp. *micranthos*	Jun Jul Aug Sept Oct	Foredune complex, dune complex, savanna complex	No status		spotted knapweed	spotted knapweed	Forb	Perennial	Asteraceae	Dicot	Invasive Non-native
Cirsium arvense	*Cirsium arvense*		Dune complex, Savanna complex	No status		Canada thistle	Californian thistle, Canada thistle, Canadian thistle, creeping thistle, field thistle	Forb	Perennial	Asteraceae	Dicot	Non-native
Cynoglossum officinale	*Cynoglossum officinale*		Foredune	No status		hound's tongue	common houndstongue, gypsy-flower, gypsyflower, hound's tongue, houndstongue	Forb	Bi-annual	Boraginaceae	Dicot	Non-native
Diervilla lonicera	*Diervilla lonicera*		Dune complex, savanna complex	No status		bush honeysuckle	northern bush honeysuckle, northern bush-honeysuckle	Shrub	Perennial	Caprifoliacea	Dicot	Non-native
Elymus canadensis	*Elymus canadensis*		Foredune complex, dune complex	No status		Canada wild rye	Canada wildrye	Graminoid	Perennial	Poaceae	Monocot	
Helianthus petiolaris	*Helianthus petiolaris*	Jun Jul Aug Sep Oct Nov	Dist dry, dune complex, foredune complex	No status		petioled sunflower	prairie sunflower, showy sunflower	Forb	Perennial	Asteraceae	Dicot	
Juniperus virginiana crebra	*Juniperus virginiana*		Foredune complex, dune complex	No status		eastern red cedar	eastern red-cedar, eastern redcedar, genévrier rouge, red cedar juniper	Tree	Perennial	Pinaceae	Gymnosperm	Native

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
Leymus arenarius	*Leymus arenarius*		Foredune complex	No status		lyme grass	sand ryegrass	Graminoid	Perennial	Poaceae	Monocot	Invasive Non-native
Lithospermum croceum	*Lithospermum caroliniense* var. *croceum*	Apr May Jun Jul Aug Sep Oct	Foredune complex, dist dry	No status		hairy puccoon	Carolina puccoon	Forb	Perennial	Boraginaceae	Dicot	
Melilotus officinalis	*Melilotus officinalis*		Dune complex, savanna complex	No status		sweet clover	yellow sweet-clover, yellow sweetclover	Forb	Perennial	Fabeaceae	Dicot	Non-native
Oenothera biennis	*Oenothera biennis*	Jun Jul Aug Sep Oct	Savanna complex, dune complex, dist dry, foredune complex	No status		common evening primrose	common evening primrose, common evening-primrose, common evening primrose, evening primrose (common), hoary evening primrose, king's-cureall	Forb	Biennial	Onagraceae	Dicot	
Opuntia humifusa	*Opuntia humifusa*	Jun Jul	Savanna complex, dune complex, foredune complex	No status		prickly pear	devil's-tongue, Nopal del este, pricklypear	Forb	Perennial	Cactaceae	Dicot	Native
Populus candicans X jackii	*Populus candicans X jackii*	Apr May	Foredune complex	No status		balm-of-Gilead, Jack's poplar	balm-of-Gilead, Jack's poplar					Non-native

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
Populus deltoides	*Populus deltoides*	Apr May	Foredune complex,	No status		cottonwood	common cottonwood, cottonwood, eastern cottonwood, plains cottonwood	Tree	Perennial	Salicaceae	Dicot	Non-native
Populus nigra italica	*Populus nigra*		Foredune complex	No status		lombardy poplar	black cottonwood, black poplar, Lombardy poplar, Lombardy's poplar	Tree	Perennial	Salicaceae	Dicot	Non-native
Populus X jackii	*Populus x jackii*		Foredune complex	No status		balm-of-Gilead	balm-of-Gilead	Tree	Perennial	Salicaceae	Dicot	Non-native
Prunus pumila	*Prunus pumila*	Apr May Jun	Foredune complex, savanna complex	No status		sand cherry	sand cherry, sandcherry	Shrub	Perennial	Rosaceae	Dicot	Native
Ptelea trifoliata mollis	*Ptelea trifoliata* var. *mollis*	Jun	Dune complex, foredune complex	No status		wafer ash, hop tree	common hoptree	Shrub	Perennial	Rutaceae	Dicot	Native
Pteridium aquilinum latiusculum	*Pteridium aquilinum* var. *latiusculum*		Foredune complex, dune complex, savanna complex	No status		bracken fern	bracken, bracken fern, northern bracken fern, western brackenfern	Fern	Perennial	Polypodiaceae	Filicinae	Native

Species	ITIS Name	Flowering	Habitat	State Status	Federal Status	Common Name	ITIS Common Name(s)	Growth Form	Life Cycle	Family	Class	Native/ Non*
Rhamnus cathartica	*Rhamnus cathartica*		Foredune complex, dune complex, savanna complex	No status		buckthorn	carolina buckthorn, common buckthorn, European buckthorn, European waythorn, Hart's thorn, nerprun cathartique	Tree	Perennial	Rhamnaceae	Dicot	Non-native
Robinia pseudoacacia	*Robinia pseudoacacia*		Foredune complex, dune complex, savanna complex	No status		black locust	black locust, false acacia, yellow locust	Tree	Perennial	Fabeaceae	Dicot	Invasive Non-native
Smilax lasioneura	*Smilax lasioneura*	Apr May Jun	Foredune	No status		common carrion flower	Blue Ridge carrion-flower, Blue Ridge carrionflower, smilax	Forb	Perennial	Liliaceae	Monocot	Native
Solidago nemoralis	*Solidago nemoralis*	Aug Sep	Prairie dry, dune complex, savanna complex, foredune complex	No status		old field goldenrod	dyersweed goldenrod, gray goldenrod	Forb	Perennial	Asteraceae	Dicot	Native
Sporobolus cryptandrus	*Sporobolus cryptandrus*		Foredune complex, dist dry, savanna complex	No status		sand dropseed	sand dropseed	Graminoid	Perennial	Poaceae	Monocot	Native
Triplasis purpurea	*Triplasis purpurea*		Prairie dry, foredune complex, dune complex	No status		sand grass	purple sand grass, purple sandgrass	Graminoid	Annual	Poaceae	Monocot	Native

Source: IDNR (2011); Wilhelm (1990)

APPENDIX D8: WILDLIFE SPECIES OF CONSERVATION CONCERN

Species Name	Common Name	Federal	State	INDU Locations/Notes
Amphibians				
Acris crepitans crepitans	Northern cricket frog		SSC	marshes/streams/lakes
Ambystoma laterale	Blue-spotted salamander		SSC	woodlands with sandy soil
Hemidactylium scutatum	Four-toed salamander		SE	bogs/woodland ponds/swamps
Necturus maculosus maculosus	Common mudpuppy		SSC	large lakes and streams
Lethobates pipiens	Northern leopard frog		SSC	bogs/marshes/shallow ponds
Reptiles				
Clemmys guttata	Spotted turtle		SE	marshes/bogs/lakes/wooded ponds
Clonophis kirtlandii	Kirtlands's snake		SE	wet grassy areas along wetlands
Emydoidea blandingii	Blanding's turtle		SE	primary aquatic/marsh
Opheodrys vernalis	Smooth green snake		SE	sandy oak woods/tall grass prairie
Sistrurus catenatus catenatus	Eastern massasauga	C	SE	marshes/fens/lake margins/dry prairie/old fields/swamp
Thamnophis proximus proximus	Western ribbon snake		SSC	wetlands
Mammals				
Condylura cristata cristata	Star-nosed mole		SSC	bog/fen/other wetlands (muck lands)
Lasionycteris notivagans	Silver-haired bat		SSC	roosts in cracks of trees/forages over water
Lasiurus borealis	Red bat		SSC	roosts in foliage of trees/forges in open habitats
Lasiurus cinereus	Hoary bat	No Status	SSC	roosts in foliage of trees/forges in open habitats
Lontra canadensis canadensis	River otter		SSC	large lakes and streams
Lynx rufus rufus	Bobcat	No Status	SSC	mixed habitats
Mustela nivalis rixosa	Least weasel		SSC	woods/grasslands/hedgerows/pond edges
Myotis lucifugus	Little brown myotis		SSC	roosts in buildings and hollow trees/forages over water
Myotis septentrionalis	Northern myotis		SSC	roosts in cracks and under bark in trees/forages in woodlots

Species Name	Common Name	Federal	State	INDU Locations/Notes
Myotis sodalis	Indiana myotis	LE	SE	roosts in cracks and under bark in trees/forages at edge of woodlots
Nycticeius humeralis	Evening bat		SE	roosts in buildings and hollow trees/forages in woodlots and open habitats
Pipistrellus subflavus	Tricolored bat		SSC	roosts in buildings and tree foliage/forages in woodlots and open habitats
Sorex hoyi hoyi	Pygmy shrew		SSC	bogs/marshes/hardwood forest (must have moist soils)
Spermophilus franklinii	Franklin's ground squirrel		SE	open areas with cover (Savanna?)
Taxidea taxus jacksoni	Badger		SSC	blowouts/prairie/farmland

SOURCE: IDNR (2011)

Notes:

C = candidate species for federal listing

LE = federally listed endangered

SE = state endangered

SSC = species of special concern

APPENDIX D9: BIRD SPECIES OF CONSERVATION CONCERN

Species Name	Common Name	Federal	State	INDU Locations / Notes
Botaurus lentiginosus	American Bittern		SE	
Ixobrychus exilis	Least Bittern		SE	
Ardea alba	Great Egret		SSC	
Nycticorax nycticorax	Black-crn Night-Heron		SE	
Nyctanassa violacea	Yellow-crn Night-Heron		SE	
Pandion haliaetus	Osprey		SE	
Haliaeetus leucocephalus	Bald Eagle	LT,PDL	SE	
Circus cyaneus	Northern Harrier		SE	
Buteo lineatus	Red-shouldered Hawk		SSC	
Buteo platypterus	Broad-winged Hawk	No Status	SSC	
Falco peregrinus anatum	Peregrine Falcon	No Status	SE	
Rallus elegans	King Rail		SE	
Rallus limicola	Virginia Rail		SE	
Gallinula chloropus	Common Moorhen	No Status	SE	
Grus Canadensis	Sandhill Crane	No Status	SSC	
Charadrius melodus circumcinctus	Piping Plover	LE	SE	
Bartramia longicauda	Upland Sandpiper		SE	
Phalaropus tricolor	Wilson's Phalarope		SSC	
Childonias niger	Black Tern		SE	
Tyto alba pratincola	Barn Owl		SE	
Lanius ludovicianus	Loggerhead Shrike	No Status	SE	Has many subspecies
Cistothorus platnesis	Sedge Wren		SE	Two subspecies
Cistothorus palustris	Marsh Wren		SE	Many subspecies
Vermivora chrysoptera	Golden-winged Warbler		SE	
Dendroica cerulea	Cerulean Warbler		SE	
Wilsonia citrina	Hooded Warbler		SSC	
Ammodramus henslowii henslowii	Henslow's Sparrow		SE	
Sturnell neglecta	Western Meadowlark		SSC	
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		SE	

SOURCE: Brock (2011)

Notes:

LT = listed threatened species

PD = proposed for delisting

SE = state endangered

SSC = species of special concern

APPENDIX D10: SUMMARY OF BENTHIC SPECIES IN LAKE MICHIGAN NEARSHORE

Taxa	Common Name	Native Species	Invasive Species	Habitat type
Turbellaria	Planarians	X		On substrate, under rocks, debris
Nematoda	Roundworms	X		On substrate and debris, within interstitial spaces of granular substrate
Bivalvia	Clams			See below
Sphaeriidae	Fingernail clams	X		On and in granular substrate
Dreissenoidea	–	X		See below
Dreissena polymorpha	Zebra Mussels		X	Attached to solid substrate
Dresissena bugensis	Quagga mussels		X	Attached to solid substrate
Oligochaeta	Segmented aquatic worms/sludge worms			Within interstitial spaces of granular substrate
Aeolosomatidae	–	X		
Enchytraeidae	–	X		
Lumbriculidae	–	X		
Stylodrilus heringianus	–	X		
Tubificidae	–			
Aulodrilus americanus	–	X		
A. limnobius	–	X		
A. pluriseta	–	X		
Ilyocryptus freyi	–	X		
I. templetoni	–	X		
Limnodrilus cervix		X		
L. claparadieanus	–	X		
L. hoffmeisteri	–	X		
L. spiralis	–	X		
L. udekemianus	–	X		
Opisthonais serpentia	–	X		
Potamothrix moldaviensis	–	X		
P. vejdovskyi moldaviensis	–	X		
Quistrodrilus multisetosus	–	X		
Rhyacodrilus coccineus	–	X		
Spirosperma ferox	–	X		
S. nikolskyi	–	X		
Tubifex ignotus	–	X		
T. americanus	–	X		
T. Tubifex	–	X		

Taxa	Common Name	Native Species	Invasive Species	Habitat type
T. superiorensis	–	X		
Variechaetidrilus augustipenis	–	X		
Naididae	–			
Amphichaeta leydigi	–	X		
Chaetogaster diastrophus	–	X		
Nais variabilis	–	X		
Paranais frici	–	X		
Piguetiella blanci	–	X		
Piguetiella michiganensis	–	X		
Uncinais uncinate	–	X		
Vejdovskyella intermedia	–	X		
Hirudinea	Leeches	X		Warm, protected shallow waters; under stones; some species are free-living and some are parasitic and found on fish, turtles, etc.
Tardigrada	Water bears			Within interstitial spaces of the substrate
Dactylobiotus sp.	–	X		
Acari	Aquatic mites	X		
Crustacea	Crustaceans			
Ostracoda	Seed shrimp	X		On and in sandy substrates, algal mats, debris and mud
Amphipoda	Scuds, sideswimmers			On and in granular substrates
Diporeia sp.	–	X		
Decapoda	Crayfish, shrimp			Within and on cobble substrate
Orconectes rusticus	Rusty crayfish		X	
Copepoda	Copepods			On and in granular substrate
Eurytemora affinis	–	X		
Acanthocyclops brevispinosus	–	X		
Diacyclops nanus	–	X		
Eucyclops agilis	–	X		
Canthocampus robertcookeri	–	X		
Heteropsyllus sp.	–	X		
Heteropsyllus nr. nunni	–		X	
Nitokra hibernica	–	X		
Paracyclops chiltoni	–	X		
Schizopera borutskyi	–		X	
Cladocera	Water fleas			On vegetation or organic material; some species free-living in the water column
Alona sp.	–	X		
Bythotrephes longimanus	Spiny waterflea		X	

Taxa	Common Name	Native Species	Invasive Species	Habitat type
Cercopagis pengoi	Fishhook waterflea		X	
Graptoleberis sp.	–	X		
Monospilus sp.	–	X		
Diptera	Flies, mosquitoes, midges			
Chironomidae	Midges	X		Live in and on the substrate
Axarus spp.	–	X		
Chironomus sp.	–	X		
Cladotanytarsus sp.	–	X		
Cryptotanytarsus sp.	–	X		
Monodiamesa sp.	–	X		
Orthocladius/Cricotopus sp.	–	X		
Paracladopelma sp.	–	X		
Psectrocladius sp.	–	X		
Tanytarsus sp.	–	X		

Source: Last *et al.* (1995)

Appendix E: Concern Response Report

Archaeology – Shipwrecks – Additional Resources
Archaeology – Shipwrecks – Coastal Processes
Plan – Cultural Resources
Plan – Cultural Resources – Additional Document Review
Plan – Cultural Resources – Thank You
Beach Nourishment – General– Aquatic Fauna
Beach Nourishment – General– Climate
Beach Nourishment – General– Frequency
Beach Nourishment – General– Sand
Beach Nourishment – Mt. Baldy – Sand
Beach Nourishment – Portage Lakefront – Other
Cobble Berm – Cost, Engineering, and Shoreline Dynamics
Cobble Berm – Habitat – Clay Valley [New]
Cobble Berm – Habitat – Invasives
Cobble Berm – Navigational / Recreational Hazard
Cobble Berm – Cobble – Physical Make-Up, Integration, and Movement
Alternative Development Process
Choosing by Advantages Process for Selection of the Preferred Alternatives
Development of Costs
Requirement for Further Studies
Reaches 1 and 2 New Alternative Proposed and Reaches 3 and 4 New Alternative Proposed
Reaches 1 and 2 New Mitigation Proposed and Reaches 3 and 5 New Mitigation Proposed
Alternatives Eliminated: Hardened Structures
Description of No Action Alternative
Proposed Modification to Reaches 1 and 2 Preferred Alternative
Reaches 1 and 2 Preferred Alternative General Questions
Proposed Modification to Reaches 3 and 4 Preferred Alternative
Consultation and Coordination – General Comments

Impact Analysis: General Methodology for Establishing Impacts / Effects
Impact Topics Dismissed for Detailed Analysis: Water Quality
Issues: Climate Change
Plan Implementation and Signal of Future Intent: Removal of Hardened Structure
Purpose and Need is Not Valid or Substantiated
Cost of Implementing the Project is Prohibitive
Compliance with Federal, State, and Local Law
Park Legislation / Authority
Park Operations: Effects of Proposal and Alternatives
Threatened and Endangered Species and Species of Concern: Impact of Proposal and Alternatives
Terrestrial Habitat: Impact of Proposal and Alternatives
Terrestrial Management Proposed Actions

CONCERN RESPONSE REPORT

The Shoreline Restoration and Management Plan/Draft Environmental Impact Statement (EIS) was made available for public review and comment during a 60-day period ending September 13, 2012. A total of 99 correspondence were submitted.

Substantive comments on the EIS focused on several topics, including issue with varying associated impacts to the environment, private lands, as well as others. The largest numbers of comments were related to the cobble berm associated with draft alternative E and its potential impacts to the shoreline, recreation, and private properties. A summary of the public comments received and the park responses to those comments are provided below.

ARCHAEOLOGY – SHIPWRECKS – ADDITIONAL RESOURCES

Concern Statement:

The EIS does not address all of the submerged cultural resources within the project's Area of Potential Effect (APE). The resources include shipwrecks that have been researched and mapped by the Indiana Coastal Management Program. The existence of these shipwrecks was mentioned at initial scoping meetings for the Shoreline Management Plan, and we would like to see acknowledgement of these cultural resources included in the Final EIS. Some new research is available now on these resources but was not referenced in the plan.

Response:

On pages 26 and 27 of the section, "Impact Topics Dismissed from Further Consideration," information about the J.D. Marshall (12PR0723) and the Muskegon (12LE0381) sites, which are within the APE for the proposed project, is provided; shipwrecks outside of the APE were not mentioned because they would not be affected by the project.

As a public document, the plan/EIS cannot disclose details and specific site locations of archeological resources. The noted section provides a general historic overview of the project area, but as a resource topic dismissed from detailed analysis there is no requirement to detail all the specific sites.

ARCHAEOLOGY – SHIPWRECKS – COASTAL PROCESSES

Concern Statement:

The EIS is unclear about the effects the various alternatives, including the preferred alternative with the submerged berm, would have on submerged archeological sites located along the shoreline. Some of the effects will be direct, such as the potential to place the berm within the boundaries of sites, increasing sediment flow that would cover several archeological sites, or accelerate the scouring of the lake bed at these locations. We believe that a more detailed assessment should address the potential direct and indirect impacts the proposed project activities may have on submerged cultural resources.

Response:

National Park Service (NPS) archeologists disagree with the presumption that nourishment material would adversely affect historic and archeological sites by accelerating the scouring effect. Nourishment activities have been conducted in the area since 1974 with no evidence of such adverse effects. Additional analysis would be conducted at the time of construction/nourishment activities to verify that the submerged resources would not be adversely affected. The illustration of the berm in the draft EIS associated with alternative E was not drawn to scale and gave the impression that stone would be placed directly on submerged resources. This was never the case. Because of concerns expressed about alternative E, a new alternative, F has been developed that meets the needs and objectives of the plan without the construction of a berm. A letter would be prepared by Indiana Dunes National Lakeshore personnel and submitted to the Indiana state historic preservation officer (SHPO) that would provide a more detailed description of the cultural resources in the project area and discuss potential effects to these resources. Per Section 106 of the National Historic Preservation Act (NHPA), implementation of the project would not proceed until the Indiana SHPO concurs with the National Park Service on a determination of "no adverse effects" to historic or archeological resources. However, with the new alternative, it is not anticipated that any of the proposed activities would alter the natural littoral drift pattern.

PLAN – CULTURAL RESOURCES

Concern Statement:

Effects of this project on submerged cultural resources have not been addressed within the draft EIS, and as such we disagree with the determination that the alternatives would have no effect on cultural resources. In addition, it would seem that the submerged cultural resources have not been addressed with regard to Section 106 of NHPA.

Response:

The National Park Service has already initiated consultation with SHPO.

The National Park Service does not believe that putting sediments into the water will have an adverse effect on submerged resources, and no sediment would be placed directly on resources during nourishment activities under any alternative.

The illustration in the draft EIS of the berm in alternative E was not to scale and gave the impression that stone would be placed directly on submerged resources. This was never the case. However, because of concerns expressed about alternative E, a new preferred alternative has been developed that meets the needs and objectives of the plan without the construction of a berm.

PLAN – CULTURAL RESOURCES – ADDITIONAL DOCUMENT REVIEW

Concern Statement:

Previous and current research which addresses submerged cultural resources along Indiana's shoreline should have been reviewed during the preparation of the draft EIS. The potential effects of the proposed project on the submerged resources were only addressed in a generalized manner - the effects of each of the alternatives were not adequately defined.

Response:

The cited previous and current documents will be reviewed by an NPS archeologist.

As noted by one of the commenters, some of the new research was unavailable to the National Park Service when the draft was developed. References will be included to the commenters report in the bibliography.

Under the new preferred alternative, the National Park Service will not be placing cobble on submerged resources.

The National Park Service has already initiated consultation with SHPO.

PLAN – CULTURAL RESOURCES

Concern Statement:

There are no archaeologists included on the list of "Preparers and Consultants," nor was any reference made to the NPS's submerged cultural resource team.

Response:

The list of "Preparers and Consultants" will be revised to reflect the NPS archaeologist Jay Sturdevant on the plan/draft EIS planning team.

Concern Statement:

It is recommended that the NPS include the following conditions within the draft EIS (1) Section 106 of the NHPA would be completed; (2) the Indiana SHPO would be consulted on any proposed project activity; (3) an archaeological survey would be conducted; and (4) archaeological sites would be avoided or mitigated) as well as the assessment of potential impacts in each applicable section of the draft EIS in regards to cultural resources. It is also recommended that a current records review be conducted to identify all known archaeological sites within the area.

Response:

The park has initiated consultation with the SHPO. Additional analysis would be conducted at the time of construction/nourishment activities to verify that the submerged resources would not be adversely affected. A letter would be prepared by Indiana Dunes National Lakeshore personnel and submitted to the Indiana SHPO that would provide a more detailed description of the cultural resources in the project area and discuss potential effects to these resources. Per Section 106 of NHPA, the National Park Service would seek a determination of "no adverse effects" to historic or archeological resources from the Indiana SHPO.

The National Park Service will include in the final EIS the conditions that the Indiana SHPO will be consulted on any proposed project activity in addition to the mitigation already included in the draft EIS in chapter 2 (page 50) that states, "areas selected for construction and beach nourishment activities would be surveyed to ensure that cultural resources (i.e., archeological

sites, historic structures, and cultural landscapes) in the area of affect are identified and protected by avoidance or, if necessary, mitigation measures."

BEACH NOURISHMENT – GENERAL – AQUATIC FAUNA

Concern Statement:

The EIS is unclear how it addresses terrestrial and aquatic site disturbance issues within the APE. Fish displacement and potential effects on fish spawning should be minimized, and localized effects on benthic communities should be examined. Further, on-site best management practices (BMPs) need to be incorporated to protect adjacent habitats, and efforts taken to prevent impacts to threatened and endangered species.

Response:

Displacement of fish assemblages would be minor and limited in scope. Fish would tend to avoid the immediate placement area, but would remain in the coastal system and return once conditions return to normal (Horvath 1999). While the displacement would be limited, the park service will work with the Indiana Department of Natural Resources (IDNR), who has permitting authority over beach fill operations, to time beach nourishment events to minimize these impacts. Beach nourishment at reaches 1 and 3 has been ongoing, off and on, for the past 25 years or more. These nourishment activities have all been coordinated with IDNR, and to date there have been no long-term impacts associated with fish displacement.

Since beach nourishment activities have been going on for some time, it is likely the current composition of the benthic community in the shoreline affected by beach nourishment is a reflection of those activities. The activities would be detrimental to individual benthic organisms or localized communities within the affected shoreline, but would not significantly alter the benthic populations in the Southern Lake Michigan shoreline as a whole.

Impacts to terrestrial systems from the active beach fill operations are also associated with beach nourishment. Appropriate BMPs would be used when applicable. Typical construction site BMPs that would not be applicable to beach nourishment would include those associated with filling riparian wetlands (lake/shore interface) and some erosion prevention measures.

In accordance with Director's Order 77 and Procedural Manual #77-1: Wetland Protection (January 2012), the NPS classifies wetlands according to the Cowardin system under which the system definition states that a wetland must have at least one of three attributes. Shorelines and beaches meet the third attribute: the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year. Per Procedural Manual #77-1, the interface between Lake Michigan and the beach is considered wetlands and as such needs to have a Wetlands Statement of Finding completed. Procedural Manual 77-1, section 4.2 "Excepted Actions" identifies certain types of activities that require modified approaches to achieve the objectives of E.O. 11990 while reducing delay and paperwork. "Excepted Actions" described in this subsection are those actions that may be excepted from the Statement of Findings requirements described in sections 5.3.4 and 5.3.5 and the compensation requirements discussed in section 5.2.3 of these procedures. The specific exception is (h) Actions designed to restore degraded (or completely lost) wetland, stream, riparian, or other aquatic habitats or ecological processes. For this exception, "restoration" refers to reestablishing environments in which natural ecological processes can, to the extent practicable, function as they did prior to disturbance.

Due to the nature of beach nourishment as a mitigative measure to protect beach "wetlands" the National Lakeshore completed a sediment compatibility analysis (Morris and Eshlemen 2011) for the most probable beach nourishment sources and submitted to the NPS Water Resources Division requesting an exemption from the Rule. The sediment compatibility analysis demonstrated that beach nourishment materials form in-lake sources were sufficiently compatible to grant the requested exemption.

Typically BMPs are put in place to prevent the excessive erosion of disturbed lands and limit the mobility of those suspended sediments. These measures are not applicable in this instance as they are in direct contradiction with the intended outcome of the beach nourishment (i.e., sediment transport).

BEACH NOURISHMENT – GENERAL – CLIMATE

Concern Statement:

Figures illustrating beach nourishment areas in the EIS are unclear and out of scale and the operational details for the sand bypass system are unclear during the winter months. We suggest using an adaptive management approach to determine beach nourishment needs through time, and that dredged sands be kept in the littoral system and not disposed of offshore.

Response:

The current preferred alternative is to primarily use nourishment material from dredged and non-dredged sources with onshore placement. There is no intent to dispose of sediments offshore. The specific source of the material would be determined in coordination with the IDNR.

The images in figure 3-5 are conceptual, depicting the general areas identified for beach nourishment under the alternatives presented; specific nourishment events could take place anywhere within these general areas. Often beach nourishments in the past have been tied to necessary dredging operations at adjacent harbor facilities. Since these harbors are the primary blocking mechanism of littoral sediment transport with the National Lakeshore, they routinely need maintenance and associated funding needed to maintain these harbors vary depending on a number of complex factors. This inherent uncertainty tied to maintenance operation facilitates the need for the EIS to capture a wide range of placement volumes. This does not preclude the modeling studies that have shown that the 105,000 yds^3 for reaches 1 and 2, and 74,000 yds^3 for reaches 3 and 4 of nourishment volumes proposed in the draft EIS would be required for the foreseeable future without respect to maintenance dredging needs.

For alternatives that include the proposed sand bypass system, the bypass system would be located below the frost line and the pump systems would require on-going maintenance to properly function following the winter months.

BEACH NOURISHMENT – GENERAL – FREQUENCY

Concern Statement:

The EIS does not provide sufficient variety in the range of alternative with respect to placement years. We suggest the EIS consider a wider range of placement options that incorporate placement frequency at more than just 1 and 5 years. We recommend alternative C-1 for reaches 3 and 4.

Response:

There are seven alternatives for reaches 1 and 2 and four alternatives for reaches 3 and 4, for a total of 11 alternatives presented in the draft EIS. In addition, alternatives that were considered but eliminated from further consideration are discussed in Chapter 2. The analysis of annual and 5-year nourishment frequencies captures a reasonable range for nourishment activities. There could be a limitless amount of variation that could conceivably be analyzed as alternatives (such as nourishment intervals between 1 and 5 years, and variations in quantities and placement length); however, the National Park Service believes the alternatives selected represent a reasonable spectrum, and that inclusion of multiple sub-variations would present no additional benefit in presenting the most environmentally acceptable and cost-effective plan.

This plan will not preclude necessary maintenance dredging up-drift of either reaches 1 or 3, however it should be understood that maintenance dredging alone will not provide quantities of sediment necessary to satisfy the sediment deficit at these sites. The intent was to fulfill the sediment deficit at reaches 1 and 3 regardless of other actions, such as maintenance dredging, which does not provide the quantities needed.

The preferred alternative for reaches 3 and 4 has been revised to alternative C-1 with annual nourishment.

BEACH NOURISHMENT – GENERAL – SAND

Concern Statement:

The EIS is unclear in defining the physical, chemical, and biological condition of acceptable beach nourishment sand. Methods for identifying acceptable sources should be clearly defined, and priority should be placed on using dredged source material rather than trucked in materials.

Response:

The current preferred alternative is to use nourishment material from a dredged source with onshore placement. The dredging source would be determined during the permitting process, based on consultation with local stakeholders and consideration of engineering constraints.

The lakeward boundary of the park extends 300 feet from the ordinary high-water mark into Lake Michigan. This shoreline area is highly dynamic and, for most of the 13 miles of shoreline within the park, is sediment limited (in need of nourishment). Dredging materials from within the park boundary is impractical and directly contradictory to the objectives of the plan/EIS. However, sediments that have accreted further offshore in the vicinity of both the Michigan City Harbor and Burns International Harbor continue to cause problems with both navigation and industrial uses due to their excess. These two locations have been identified as the most probable donor locations for beach nourishment sediments. As such, the National Park Service has

assessed the physical, chemical, and biological conditions of the target nourishment areas and performed a sediment compatibility analysis (Morris and Eshlemen 2011; Simon et al. 2012) to ensure those accreted donor nourishment materials meet the desired criteria.

The intent of beach nourishment is to replicate, with donor materials, the ambient condition such that the nourished condition is indistinguishable physically, chemically and biologically from the ambient or native condition. To establish the ambient condition for beach nourishment activities within the Indiana Dunes National Lakeshore, the park used a geometric design to characterize both long-shore and cross-shore variability in sediments by collecting grab samples from 70 locations (nodes) within a 100 by 90 meter sampling zone. Nodes were arranged in a staggered grid formation maintaining 10 meters distance from each adjacent node. Sampling zones were arranged such that approximately half the nodes would fall on land while the other half would be in the water. Samples within each nourishment area were composited and analyzed for sediment chemistry, toxicity, grain size characterization, porosity, and compaction. Specific methods and results from these analyses can be found in Simon et al. 2012.

The text for the no action alternative in reach 1 will be revised to include nourishment from both mined and dredged sources.

BEACH NOURISHMENT – MT. BALDY – SAND

Concern Statement:

The EIS is unclear in defining the beach nourishment target area within reach 1. The EIS refers to Mt. Baldy, but we question if the EIS should indicate Crescent Dune which is adjacent to Mt. Baldy to the east? Additionally, the EIS repeatedly suggests sand mining updrift of Michigan City Harbor. However, little information is provided on the implication to Michigan City Beaches should this occur. We recommend the EIS focus more attention on utilizing those sands that have bypassed the Harbor.

Response:

The current preferred alternative is to use nourishment material from a dredged source with onshore placement. The EIS has used the term Mt. Baldy because it is a readily recognized landmark, but the nourishment would actually take place at the adjacent Crescent Dune.

The preferred alternative has been revised to a new hybrid alternative F which includes annual beach nourishment with a mix of small natural stone at the shoreline of reach 1. The source location of the nourishment material would be determined in coordination with IDNR in areas of accretion so that dredging activities would not disturb areas of equilibrium. Alternative sources would be identified prior to implementation of the alternatives. Accretion areas have been identified as source locations and dredging would bring these areas to more closely represent natural shoreline processes. In the event that an identified source is not appropriate, an alternate location would be selected. The text in the plan/EIS has been revised to reflect coordination with IDNR for selection of nourishment source material.

With regard to the concerns that the National Park Service focus more on utilizing the sediments that have bypassed the Michigan City facility, the sediment budget calculated for reaches 1 and 2 clearly indicate that there is insufficient sediment getting beyond that facility. Therefore the EIS indicates a desire to obtain sediments that are trapped by that facility and return them to the shoreline system.

Note that because lake levels have dropped, more beach is visible; however, that does not mean that the beach is building up. The Mt. Baldy area continues to be exposed to continued erosion which would be more pronounced as lake levels rise again.

BEACH NOURISHMENT – PORTAGE LAKEFRONT – OTHER

Concern Statement:

The preferred alternative for reach 3 will provide too much sand in one slug and will have unintended effects on navigational access to Burns International Harbor. Increased frequency of small slugs of sand will prevent excessive navigational issues and will also allow for seasonal needs dictated by extreme weather events to be addressed more directly.

Response:

Under the discussion of alternative C-5: Beach Nourishment via Dredged Sources, 5-Year Frequency in Chapter 2 (page 67), the text states, "Sediment could be captured by the federal channel at the Burns International Harbor, which could increase maintenance dredging costs." The National Park Service acknowledges that dredging would be required to reestablish more natural flow as more sediment in the water would naturally migrate into the waterway.

Dredging is currently conducted by the U.S. Army Corps of Engineers (USACE) as a duty to maintain navigation of the harbor; National Park Service assumes that the USACE would continue to maintain the harbor during storm events if nourishment material from reach 3 is deposited in the harbor through natural wave action. While wave induced deposition of sediments into the harbor are unavoidable natural consequences of operating a harbor along southern Lake Michigan that blocks littoral sediment transport, the National Park Service realizes that placing an entire 5-year sediment deficit volume of nourishment material on the beach at Portage Lakefront and River Walk (alternative C-5) may exacerbate navigational issues at the harbor beyond that which would naturally occur. Thus, the preferred alternative for reaches 3 and 4 has been changed to alternative C-1 with annual nourishment which was assessed in the draft EIS. Under alternative C-1 only the annual sediment deficit would be placed in a given year. Any harbor maintenance issues associated with this placement volume should be consistent with natural conditions.

COBBLE BERM – COST, ENGINEERING, AND SHORELINE DYNAMICS

Concern Statement:

The EIS does not sufficiently discuss: the scope of the cost of implementing alternative E, Submerged Cobble Berm; the engineering specifications and functional application of the cobble berm technology in Lake Michigan; or the cobble berms effects on wave and current dynamics along the shoreline. The cobble berm would modify the existing shoreline dynamic and push the erosion problem further to the west along reach 2.

Response:

Due to the conceptual nature of the alternative presented in the Draft EIS, the costs were estimates based upon professional judgment. The estimated cost for alternative E, Submerged Cobble Berm and Beach Nourishment, Annual Frequency was $20.4 million. It was recognized that additional engineering studies would be necessary to implement the alternative. However, a hybrid alternative (alternative F), which incorporates the full diversity of nourishment materials using an approach other than the berm, has been developed as the new preferred alternative. This alternative, consisting of annual nourishment with a mix of small natural stone at the shoreline at reach 1, incorporates desired aspects of multiple alternatives which will meet park purposes and objectives, yet addresses public concern with the draft preferred alternative E. There is no reason to believe that nourishment activities in Reach 1 would cause erosion problems further west down the shore in Reach 2.

COBBLE BERM – HABITAT – CLAY VALLEY

Concern Statement:

The EIS does not fully address the effects of the cobble berm on existing lake-bottom conditions. The cobble would increase down-cutting and threaten unique offshore "clay valley" habitats used for fish spawning.

Response:

The Indiana Dunes National Lakeshore shoreline within reach 1 is currently experiencing a high rate of erosion. The sandy substrate at the base of Mount Baldy has eroded away, exposing a clay layer that is now being undercut by wave action. The cobble berm would decrease rather than increase down-cutting.

The submerged cobble berm would be comprised of aggregate material from local glacial deposits which would be re-distributed across the lake bottom by natural wave action. The distribution would move the smaller aggregate closer to the shoreline, while the larger material would generally stay within a few feet of the submerged cobble berm. Distribution would be variable, depending on the intensity of storm events. Prior to breakdown of the submerged cobble berm, wave energy within the nearshore would be dissipated, thus increasing the likelihood of sediment retention in the nearshore. After the submerged cobble berm has been spread along the lake substrate, lakebed down-cutting would decrease as the aggregate material would create a protective layer.

The region of the clay utilized by yellow perch for spawning lies in 30 plus feet of water. The 30-foot depth is beyond the depth of closure where active wave energy would transport the cobble material; therefore, the material would not be expected to move into the clay valley depressions and impact the yellow perch populations.

However, the hybrid alternative (alternative F), which incorporates the full diversity of natural sediment aggregate using an approach other than the berm, has been developed as the new preferred alternative. This alternative, consisting of annual nourishment with a mix of small natural stone at the shoreline at reach 1, incorporates desired aspects of multiple alternatives which will meet park purposes and objectives, yet addresses public concern with the draft preferred alternative E.

COBBLE BERM – HABITAT – INVASIVES

Concern Statement:

The EIS does not fully address the ecological consequences of placing large quantities of cobble on the lakebed, nor does it provide sufficient evidence that these materials are a natural component of the system. These cobble materials would provide habitat for invasive fish species and attachment surfaces for both invasive muscles and cladophora adjacent to known yellow perch spawning habitats.

Response:

Glacial remnants of rock and cobble are common along the dynamically stable shoreline along reach 1 (Morris et al. 2014). The sandy habitats around Beverly Shores were sampled in the summer of 2011 to determine sediment composition. Sediment samples were collected from a matrix of 70 stations distributed both long-shore and cross-shore to capture a 100-meter reach.

No alternative proposed would either promote or hinder Zebra or Quagga mussel populations. These mussel species already exist in Lake Michigan and none of the proposed alternatives would alter this fact. Live Zebra and Quagga mussels are infrequently found in the active shoreline region as the dynamic and abrasive nature of the churning sediment and rock prevents stable attachment surfaces. In the summer of 2011, over 500 sediment samples were collected using a sediment dredge from the shoreline affected by beach nourishment. No live Zebra or Quagga mussels were found, though there were a number of dead shells likely washed in from deeper, more stable habitats that would be unaffected by shoreline processes.

The abrasive nature of the dynamic shoreline regions also limits the ability of *Cladophora* to attach to solid surfaces. The successful integration of natural gravels and stones into the sand rich composition of the shoreline area of reach 1 will result in a condition that is indistinguishable from that already existing in dynamically stable down-drift areas (Morris et al. 2014). As there is currently no excessive cladophora or botulism issue in this area, there is no reason to believe that restoring reach 1 to a condition approximating conditions in the dynamically stable (Baird 2004) sections of reach 2 will change.

The shoreline region affected by beach nourishment is not a highly utilized habitat by round gobies. The dynamic sediment rich habitats found along the southern Lake Michigan shoreline do not offer the larger interstitial spaces preferred by round gobies for reproduction. While larger stone substrate is natural to the system (Morris et al. 2014; Hawley and Judge 1969) it is typically heavily embedded and regularly covered and exposed by the migration of sandbars both long-shore and cross-shore (Davis and McGeary 1965). National Park Service observations have shown that round goby presence along the shoreline is limited, and dominated by young individuals less than 50 millimeters (mm) long, generally considered one year old (MacInnis and Corkum 2000). From 2010 to 2011, over 240 sampling efforts, spread across 24 shoreline reaches within the Indian Dune National Lakeshore, were completed. A total of 22,924 individual fish were collected representing 31 species. Only 82 round goby individuals (0.004% of the total assemblage) were collected, having an average length of 50 mm. These data are consistent with other research around the Great Lakes. Moran and Simon (2013) found a similar relationship with natural gravel/sand substrates in Lake Erie. They observed a significant decrease in both relative abundance and catch per unit effort of round goby over natural gravel habitats. They attributed this, in part, to the highly territorial nature of adult male gobies (Jude et al. 1995) and their potential exclusion of smaller individuals from other, more desirable, habitats (Ray and

Corkum 2001; Johnson et al. 2005). There is no evidence to suggest the restoration of natural substrates, through beach nourishment would provide habitat opportunities that do not already exist along the shoreline. In actuality, research has shown that migration pathways of round gobies have not been via the shoreline area impacted by beach nourishment (Moran and Simon 2013), rather, they have spread throughout the region via the more stable lakebed pathways in water depth exceeding 30 feet, beyond the depth of closure, and outside the influence of costal processes. The clay valleys off-shore of reach 1 reside in approximately 30-feet of water and are already impacted by round gobies independently of beach nourishment activities. Habitats affected by beach nourishment are not desirable for round goby reproduction and those round gobies found in these habitats are small in size and represent only a tiny fraction of the total fish fauna.

Note that a hybrid alternative (alternative F), which incorporates the full diversity of natural sediment aggregate using an approach other than the berm, has been developed as the new preferred alternative. This alternative, consisting of annual nourishment with a mix of small natural stone at the shoreline at reach 1, incorporates desired aspects of multiple alternatives which will meet park purposes and objectives, yet addresses public concern with the draft preferred alternative E.

COBBLE BERM – NAVIGATIONAL / RECREATIONAL HAZARD

Concern Statement:

Figures provided in the EIS do not accurately present the placement of the cobble berm nor does it provide adequate information on how the berm will be marked to minimize risk to recreational boating craft.

Response:

It was recognized that additional engineering studies would be necessary to implement the alternative. The berm was intended to be installed in at least 6 feet of water which should have been no hazard for recreational boating. However, the potential for creating an attractive hazard was recognized, and the intent was to provide some temporary warning devices to keep swimmers away until the berm dissipated. A hybrid alternative (alternative F), which incorporates the full diversity of natural sediment aggregate using an approach other than the berm, has been developed as the new preferred alternative. This alternative, consisting of annual nourishment with a mix of small natural stone at the shoreline at reach 1, incorporates desired aspects of multiple alternatives which will meet park purposes and objectives, yet addresses public concern with the draft preferred alternative E.

COBBLE BERM – COBBLE – PHYSICAL MAKE-UP, INTEGRATION, AND MOVEMENT

Concern Statement:

The EIS does not fully address the hydrologic consequences of placing large quantities of cobble on the lakebed, nor does it provide sufficient evidence that these materials are a natural component of the system.

Response:

Due to the conceptual nature of the alternative presented in the draft EIS, it was recognized that additional engineering studies would be necessary to implement the alternative.

In 2012 the National Park Service studied the presence of large particles >19 mm (Table 1) in the onshore and aquatic zones along the southern coast of Lake Michigan, because this fraction was considered a critical part of the natural substrate (Morris et al. 2014). Figure 1 depicts the littoral transport in reaches 1 and 2.

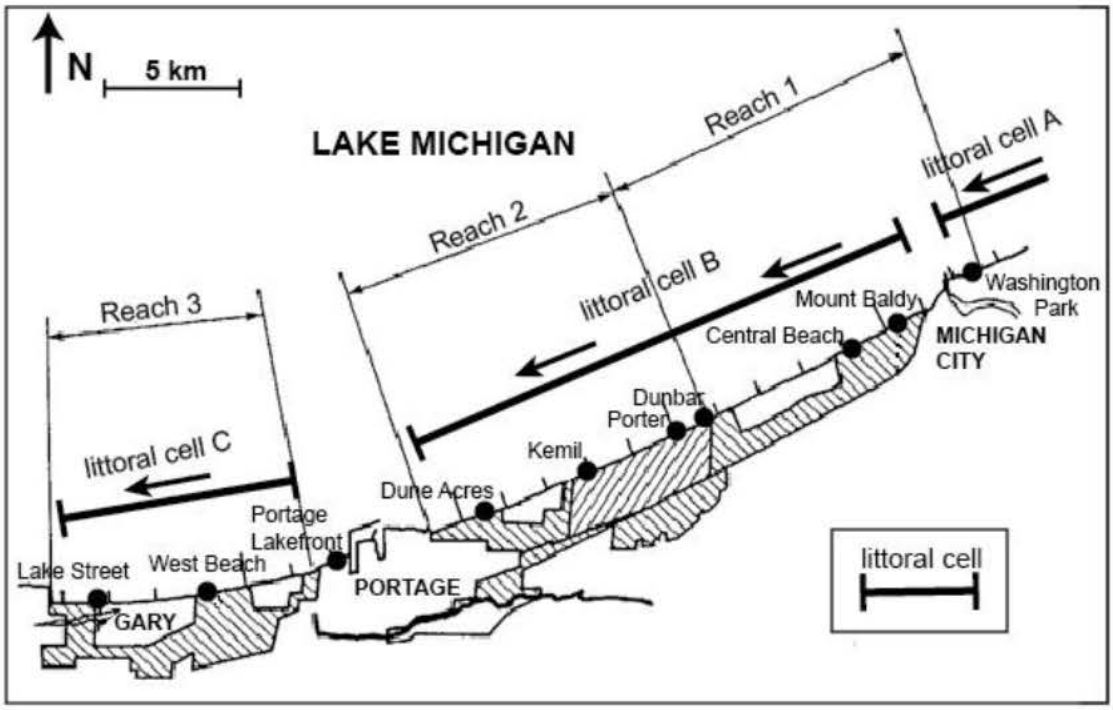

FIGURE 1. LITTORAL TRANSPORT.

TABLE 1. LARGE PARTICLE SIZE CATEGORIES FOLLOWING THE AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) (UNIFIED) GRAIN-SIZE CLASSIFICATION. THE SEDIMENT SIZE PROVIDED REPRESENTS THE LOWER LIMIT OF EACH CATEGORY.

Size (mm)	Size (in.)	Classification
>300	>12.0	Boulder
75	3.0	Cobble
19	0.750	Coarse gravel

Particles with a single axis >19 mm were collected from five random square meter grids placed in the wash zone (land/water interface) during a 15 minute search and from three targeted square meter grids in a 15-minute search of the onshore zone. Individual particles were measured in the laboratory for maximum length or long diameter (a-axis), maximum width or intermediate diameter (b-axis), and maximum depth or short diameter (c-axis), and characterized in to three categories: compact, elongate, or platy (Figure 2).

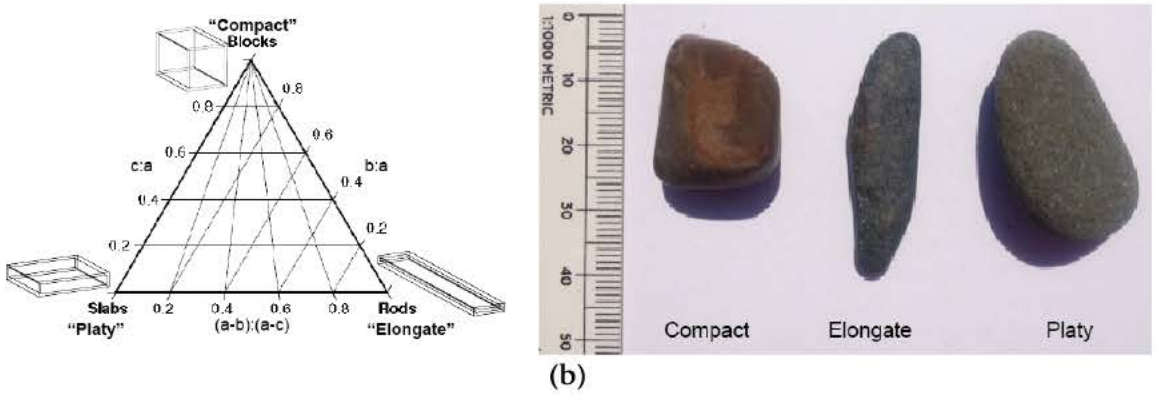

FIGURE 2. (A) DIMENSIONAL CLASSIFICATION OF LARGE PARTICLES (>19 MM) AFTER THE WORK OF SNEED AND FOLK (1952). (B) EXAMPLES OF COMPACT, ELONGATE, AND PLATY LARGE PARTICLES.

Large particles in the onshore zone. Six beaches contained large particles in the onshore zone though the number and dimensions varied from east to west, coincident with the local direction of movement of littoral drift. Beaches in reaches 1 and 2 including Mt Baldy, Central Beach, and Dunbar, are considered erosional or dynamically stable. These reaches contained a higher number of large particles than areas studied to the west in reach 3 and individual particles had a comparatively larger maximum length (a-axis). The large particles at Mt Baldy (n=75) had a maximum diameter length that varied from coarse gravel to small cobbles (range: 20.26-93.30 mm) with the mean size being coarse gravel 35.56 mm (Figure 3, Table 2). The large particles at Central Beach (n=23) had a maximum length that varied from coarse gravel to large cobbles (range: 34.09-139.51 mm) with the mean size being coarse gravel at 67.64 mm (Figure 3, Table 2).The large particles at Dunbar (n=107) had a maximum length that varied from coarse gravel to cobbles (range: 26.35-117.40 mm) with the mean size being coarse gravel at 59.76 mm (Figure 3, Table 2).

Large particle counts decreased or were absent at accretionary beaches where the reaches experience greater deposition of finer particles. The large particles at Portage Lakefront (n=79) had a maximum length within the coarse gravel class (range: 20.15-56.98 mm) with the mean size being coarse gravel at 30.35 mm (Figure 3, Table 2). The large particles at West Beach (n=31) had a maximum length that varied from coarse gravel to small cobbles (range: 23.08-90.30 mm) with the mean size being coarse gravel 46.79 mm (Figure 3, Table 2). There were no particles >19 mm found at Lake Street in the onshore zone. The large particle distributions at all onshore reaches are dominated by coarse gravels (Tables 4).

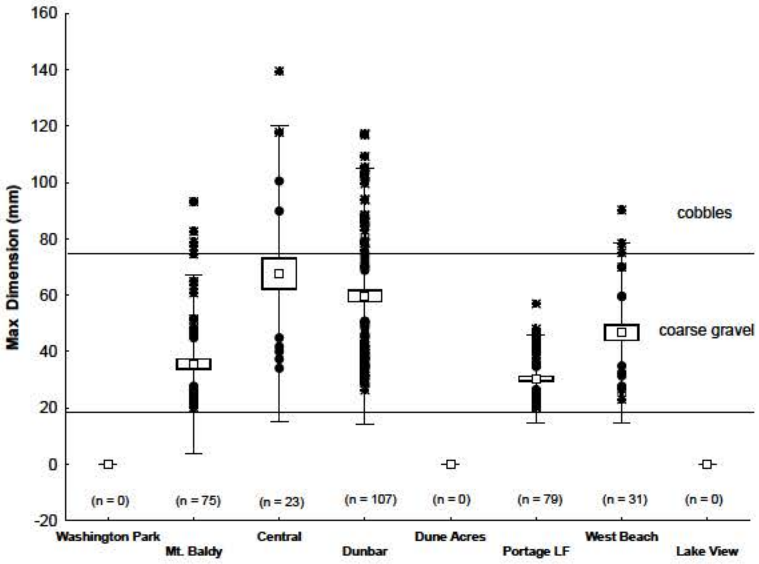

FIGURE 3. PEBBLE COUNT AND MAXIMUM DIMENSIONS OF LARGE FRACTION MATERIALS FROM THE ONSHORE ZONE IN EIGHT BEACHES IN THE INDIANA DUNES NATIONAL LAKESHORE.

TABLE 2. ONSHORE

Site	Coarse Gravel (19-75 mm)	Cobbles (75-300 mm)	Total Count
Mt. Baldy	71	4	75
Central Beach	15	8	23
Dunbar	82	25	107
Portage Lakefront	79	0	79
West Beach	28	3	31
Total	275	40	315

Large particles in the aquatic zone. Large particles in the aquatic (nearshore) zone are important for general sediment characterization and constitute a critical component of the substrate with regards to aquatic habitats. Large particles at Mt. Baldy (n=155) had a maximum length that varied from coarse gravel to small cobbles (18.41-93.30 mm) with the mean size being on the finer side of the coarse gravel class (25.83 mm) (Figure 4, Table 3). The largest particles were observed at Central Beach. Central Beach (n=129) had a maximum length that varied from coarse gravel to cobbles (21.47-165.10 mm) with the mean size being coarse gravel (51.17 mm) (Figure 4, Table 3). Dunbar Access had the highest total large particle count (n=256) and particles had a maximum length that varied from coarse gravel to small cobbles (20.01-117.40 mm) with the mean size being coarse gravel (32.01 mm). The large particle distributions at all onshore reaches are dominated by coarse gravels (Figure 4, Table 3).

Relationships among the six beaches show that the accretionary beaches of Washington Park, Dune Acres, Portage Lakefront, West Beach, and Lake Street Access did not contain large particles >19 mm in the aquatic zone (Figure 4). The data are consistent with results from onshore-offshore sediment profiles in previous work that observed small areas of anomalously coarse sediment (Hawley and Judge 1969) and a strong correlation between coarse sediment and troughs in the near shore zone (Davis and McGeary 1965).

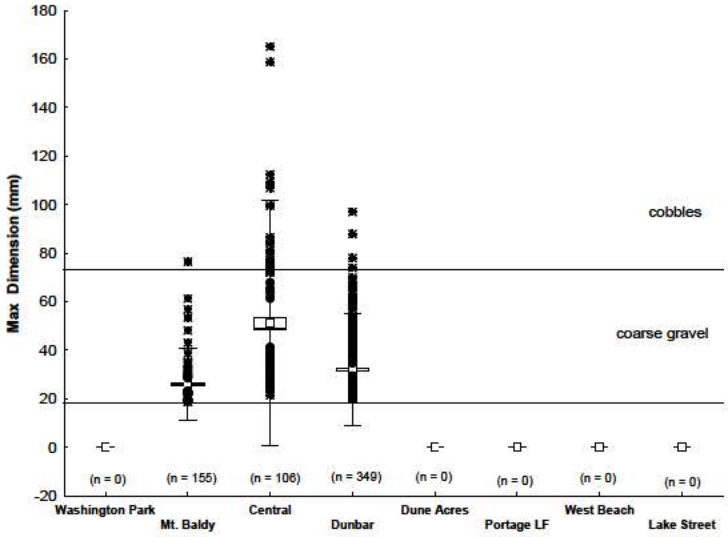

FIGURE 4. PEBBLE COUNT AND MAXIMUM DIMENSIONS OF LARGE FRACTION MATERIALS FROM THE AQUATIC ZONE IN EIGHT BEACHES IN THE INDIANA DUNES NATIONAL LAKESHORE.

TABLE 3. AQUATIC

Site	Coarse Gravel (19-75 mm)	Cobbles (75-300 mm)	Total Count
Mt. Baldy	142	12	155
Central Beach	92	14	106
Dunbar	346	3	349
Portage Lakefront	0	0	0
West Beach	0	0	0
Total	580	29	610

Pebble Dimensions. Note that each particle is classified on the ASTM (unified) Classification scale by measurement of the axis with longest diameter. Particles >19 mm are classified as "coarse gravel" if the long-axis measures 19-75 mm, "cobbles" if the long-axis measures 75-300 mm, and "boulders" if the long axis measures >300 mm. All large particles found on the southern shoreline of Lake Michigan fell within the range of coarse gravel to cobbles (19–300 mm) (Figure 3 and 4). However, the largest particle found was a cobble found at Central Beach, measuring 165.10 mm (6.5 in.).

All particles in this study meeting the size criteria of large pebbles or cobbles were classified as either compact, platy, or elongate according to the work of Sneed and Folk (1958) and Pirie (1965) (Figure 2, Tables 4 and 5). Particles are considered compact when the c:a and b:a ratios both exceed 0.5. Particles are classified in this study as platy when the c:a and b:a ratios are both less than 0.5 and when (a-b):(a-c) is less than 0.5. Remaining particles are classified as elongated according to the classification.

Large particles >19 mm were observed in the onshore zone at five of the seven study areas and >90% of those particles were classified as platy or elongate (Table 4). These particles represent

the flat "beach rocks" often described by visitors. Large particles >19 mm were observed in the aquatic zone of three of the seven study areas (Table 5). Platy or elongate particles constitute 49%-75% of the large particle component of the substrate. At Mt. Baldy the large particle substrate in the aquatic zone was comprised of 25% compact particles and 75% flat (platy or elongate) particles. At Central and Dunbar Beaches the aquatic substrate was comprised of ~50% compact particles and ~50% flat (platy or elongate) particles.

TABLE 4. CLASSIFICATION OF LARGE PARTICLES >19 MM COLLECTED AT INDIVIDUAL STUDY SITES FOR THE ONSHORE ZONES ACCORDING TO SNEED AND FOLK (1958). NUMBER IS PARENTHESES REPRESENT PERCENT OF TOTAL PARTICLES.

Site	Total Particles	No. of Compact	No. of Platy	No. of Elongate
Michigan City	0	0	0	0
Mt. Baldy (East)	75	0	64(85%)	11(15%)
Central Beach	23	1(4.5%)	21(91%)	1(4.5%)
Dunbar	107	0	88(82%)	19(18%)
Portage Lakefront	79	1(1)	62(79%)	16(20%)
West Beach	31	0	27(87%)	4(13%)
Lake Street	0	0	0	0

TABLE 5. CLASSIFICATION OF LARGE PARTICLES >19 MM COLLECTED AT INDIVIDUAL STUDY SITES FOR THE AQUATIC ZONES ACCORDING TO SNEED AND FOLK (1958). NUMBER IS PARENTHESES REPRESENT PERCENT OF TOTAL PARTICLES.

Site	Total Particles	No. of Compact	No. of Platy	No. of Elongate
Michigan City	0	0	0	0
Mt. Baldy (East)	155	40(26%)	52(34%)	63(41%)
Central Beach	106	54(51%)	35(33%)	17(16%)
Dunbar	349	160(46%)	77(22%)	112(32%)
Portage Lakefront	0	0	0	0
West Beach	0	0	0	0
Lake Street	0	0	0	0

A two-dimensional numerical model (COSMOS) was used to calculate sediment transport rates along the shoreline at selected intervals of 1.25 miles for current and historic pre-harbor conditions. The beach profiles extended out to a depth of approximately 15 meters (or approximately 49 feet) below chart datum (LWD). It was determined that the net longshore sediment transport gradually decreases from New Buffalo (200,000 yd^3 updrift of Michigan City) east to the Burns International Harbor. The average longshore sediment transport rate is estimated at less than 30,000 yd^3 per year near the Gary-U.S. Steel Harbor. Generally, larger particle size material would have a slower transport rate than finer sediment. Additional studies would be necessary to determine the sediment transport rate for the specific nourishment mix proposed.

ALTERNATIVE DEVELOPMENT PROCESS

Concern Statement:

One commenter expressed concern that the analysis of impacts in this EIS may be too speculative because of the conceptual nature of the alternatives. In addition, concerns are expressed about the length (shelf life) of the EIS at 20 years, rather than a much greater planning horizon.

Response:

The plan/final EIS is a management plan that would provide the partners/players/participants with guidelines for management decisions specific to shoreline restoration. Following approval of the plan, the National Park Service would be able to implement annual beach nourishment procedures outlined within the plan should that opportunity arise in the near future. The National Park Service believes that the alternatives (which present approaches for shoreline restoration) in this plan are defined with an overall appropriate level of detail to determine the general environmental and social effects allowing us to select a proposed alternative. Additional studies and plans may be necessary to move toward implementation as acknowledged in the plan/final EIS.

The 20-year period of analysis is National Park Service's normal planning horizon and is much more conservative. The National Park Service feels that forecasting out 50 years would be less accurate and potentially unresponsive to changes in the local environment than the shorter defined planning period.

CHOOSING BY ADVANTAGES PROCESS FOR SELECTION OF THE PREFERRED ALTERNATIVES

Concern Statement:

Concern was expressed about the process used to identify a preferred alternative.

Response:

The choosing by advantages (CBA) process is the National Park Service's method of providing a recommendation for the preferred alternative. Planning team decisions made during the CBA process were based on the importance of advantages between the alternatives. This involved identifying the attributes or characteristics of each alternative relative to the factors described in the Draft EIS, determining the advantages for each alternative for each factor, and then assessing the importance of each advantage. The relationship between the advantages and costs of each alternative were also considered. The CBA process was documented, is reproducible, and provided the rationale for recommending the preferred alternatives. Note: The alternatives presented in this plan present general guidelines for shoreline restoration and management. Site-specific elements within these general guidelines could require coastal modeling and scientific analysis prior to implementation however this does not preclude beach nourishment activities resulting from harbor maintenance activities.

DEVELOPMENT OF COSTS

Concern Statement:

Commenters state that an economic analysis was not part of the plan. Some felt that more attention to the costs of the proposals would have led to a better evaluation of them. The lump sum costs were felt to be inadequate. In addition, they question assumptions concerning the timing of activities, and note that some of the costs concerning the sediment bypass alternative seem inflated.

Response:

There is a cost comparison presented in Tables 2-2A and 2-2B of the draft EIS, and costs are included in the text description of the alternatives in Chapter 2. The relationship between the advantages and costs of each alternative were also considered during the CBA workshop. This information was used to identify the alternatives that provided the National Park Service and the public and private partners the greatest advantage for the most reasonable cost. Detailed costs were not developed due to the conceptual nature of the designs proposed for the alternatives. Costs estimates were conservatively developed for individual alternatives and did not assume combined mobilization events. The intent of the statement, "in all reaches of the project area at the same time" is that shoreline restoration would be implemented across all reaches of the project area from the implementation of the plan, rather than focusing on one reach and then another.

The costs associated with the bypass systems are only partially related to the length of the piping and the initial construction of the system. With alternative D for reaches 1 and 2, the source for material is located at some point north of the Michigan City Marina. The specific location of sediments will change periodically as the immediate location for the source for sediment changes. Sources immediate to the end of the bypass would likely be used first but would deplete over time. Then sediments from further away from the end of the bypass system would need to be moved to the bypass system, resulting in increased effort and costs. The source for sediment in alternative D for reaches 3 and 4, which is nearly half the annual volume needed in reaches 1 and 2, is not likely to change since it is located at the intake for the Northern Indiana Public Service Company (NIPSCO)/Bailly complex. Besides logistical costs, maintenance costs were also a factor; with nearly twice the volume, maintenance costs associated with the bypass in reaches 1 and 2 meant greater long term costs.

REQUIREMENT FOR FURTHER STUDIES

Concern Statement:

Commenters requested more analysis of some alternatives. Concerns were expressed about the potential impacts that needed more study, including impacts that are not necessarily environmental. Finally, one commenter expressed concern that while the EIS states where further studies are necessary, it does not clearly state what actions can take place after the finalization of the EIS process.

Response:

At this point, it would be premature to provide the level of detail requested by some of the commenters since it is not known which parties may be participating in the restoration efforts in the future. As stated in the EIS, operationally the National Park Service cannot accomplish the proposal actions on its own. Full implementation would require cooperation and coordination between local, state, and federal agencies. This plan will hopefully initiate a dialogue between stakeholders, and provides a study of potential solutions going forward. The National Park Service does believe that while some level of design might be required to proceed, the impact analysis is sufficient to allow some level of beach nourishment with appropriate consultation, but without additional compliance concerns.

As stated in the Summary (on page iv) and under "Needed Future Studies and Plans" (page 38), "Once this plan is completed, many of the nourishment activities proposed under the alternatives could be implemented without further compliance or study. Other more detailed studies and plans would be needed before some specific actions could be implemented, including design specifications." Nourishment and terrestrial management activities associated with the plan could be implemented without further compliance or study.

REACHES 1 AND 2 NEW ALTERNATIVE PROPOSED AND REACHES 3 AND 4 NEW ALTERNATIVE PROPOSED

Concern Statement:

Several commenters asked whether the National Park Service should look into replacing/modifying certain existing structures that currently interrupt the natural sediment flow along the shoreline. Other commenters suggested other modifications to the proposed alternatives by considering a 3-year nourishment interval and inquired about impacts.

Response:

A hybrid alternative (alternative F), which incorporates the full diversity of natural sediment aggregate using an approach other than the berm, has been developed as the new preferred alternative. This alternative, consisting of annual nourishment with a mix of natural stone at the shoreline at reach 1, incorporates desired aspects of multiple alternatives which will meet park purposes and objectives, yet addresses public concern with the draft preferred alternative E. Modification of harbor structures would not be within the National Park Service jurisdiction to implement. As such, modification of NIPSCO pier would not be within the National Park Service jurisdiction to implement.

The analysis of annual and 5-year nourishment frequencies captures a reasonable range for nourishment activities. There would be a limitless amount of variation that could conceivably be analyzed as alternatives (such as nourishment intervals between 1 and 5-years, and variations in quantities and placement length); however, the National Park Service believes the alternatives selected represent a reasonable spectrum, and that inclusion of multiple sub-variations would present no additional benefit in presenting the most environmentally acceptable and cost-effective plan.

Timing of heavy machinery mobilization and de-mobilization along with beach closures would be coordinated to minimize public intrusion. To the extent possible, efforts would be made to minimize impacts on visitor experience by conducting beach nourishment activities during off-peak months (i.e., during fall and winter months).

REACHES 1 AND 2 NEW MITIGATION PROPOSED AND REACHES 3 AND 4 NEW MITIGATION PROPOSED

Concern Statement:

One commenter suggested additional mitigation be spelled out in the final EIS, and requested a greater commitment to the mitigation already in the EIS.

Response:

The draft EIS was remiss in not properly defining the specific type of wetlands being referred to on page 48 for mitigation. The National Park Service has adopted the Cowardin definition of wetlands; besides the three criteria defined by the USACE as wetlands, the Cowardin definition includes shorelines that meet the USACE definition but wave action or other physical features (type of soil) prevents the formation of vegetation. For this plan, construction staging and operation would unavoidably be located within the shoreline wetland areas. Mitigation measures to minimize impacts to these types of wetlands are listed on page 48, and will be adopted by the Record of Decision. As stated on page 18, "Temporary impacts to the existing beach wetlands would be unavoidable within the specific site where the shoreline would be nourished. The post-restoration shoreline would be expected to result in the same acreage of the same wetland type as exists now, but shifted northward (or at least maintained in its present position) because a comparable shoreline profile is expected to develop. Since there would be no net loss of the beach wetland habitat, the project could be considered under the Restoration Exception in Section 4.2.1 (h) of NPS Director's Order (DO) 77-1: Wetland Protection and Procedural Manual #77-1." As stated on page 50, the "rare, threatened, and endangered species' surveys would be determined as deemed warranted by NPS resource staff and specialists. It is the National Park Service's mission to preserve park resources and it is inherent within our mission to protect rare, threatened, or endangered species that could be affected by the proposed project." The National Park Service would make this commitment in the Record of Decision.

ALTERNATIVES ELIMINATED: HARDENED STRUCTURES

Concern Statement:

Commenters inquired about the consideration of a permanent fixed berm and why that was dismissed.

Response:

During scoping for the selection of the proposed alternatives, the planning team determined that alternatives with permanent, hardened structures would not meet the goals of the plan. Hardened structures have historically provided protection for infrastructure from erosion and storm events. However, these structures may not have been beneficial to the entire shoreline. The alternatives developed for this plan were developed to benefit the entire shoreline as opposed to a single land owner or shoreline user. The purpose of the draft EIS is to identify and develop strategies to

restore the Indiana Dunes National Lakeshore shoreline and its processes with a reestablishment of more natural shoreline processes. The implementation of hardened structures would not be conducive to the reestablishment of more natural shoreline processes.

DESCRIPTION OF NO ACTION ALTERNATIVE

Concern Statement:

Commenters expressed concern that the EIS has mischaracterized the level of existing planning for the shoreline, and that the EIS has assumed existing conditions for the no action alternative that do not actually exist.

Response:

Shoreline feasibility studies of the Indiana coast and Congressional authorization to conduct beach nourishment are not the same as a comprehensive shoreline restoration plan that provides comprehensive guidance for restoring natural shoreline processes and preserving the shoreline ecosystems.

The National Park Service assumes that on average, the USACE nourishment activities would continue because that is consistent with current and past nourishment activities. Although it is understood that these activities are dependent upon Congressional earmarks, and that there is no guarantee that these earmarks would continue, the approach of defining the no-action alternative based upon recent nourishment programs is the more conservative approach. Effect from the implementation of action alternatives are defined based on a comparison with the no-Action alternatives. Had the no-action alternatives been defined under the assumptions that the USACE nourishment activities would not continue, then beneficial effects of the proposed nourishment would seem exaggerated, as would the adverse effects of the implementation of the no-action alternative. In addition, it would have presented conditions at the shoreline that actually do not exist; the shoreline has benefitted from periodic nourishment.

Defining alternative A as the "no-action" alternative is consistent with the National Environmental Policy Act of 1969, as amended, regulations of the Council on Environmental Quality (40 Code of Federal Regulations 1508.9), and NPS DO 12: Conservation Planning, Environmental Impacts Analysis, and Decision-making and its accompanying handbook. The no-action defines the activities that would occur in the event that none of the action alternatives are implemented; this is not always necessarily the same as "present practice." Since it can be assumed that the USACE would continue beach nourishment as they have in past years, it would not be realistic to evaluate an alternative where nourishment activities were terminated.

PROPOSED MODIFICATION TO REACHES 1 AND 2 PREFERRED ALTERNATIVE

Concern Statement:

One commenter questioned the discussion and use of adaptive management as described in the draft EIS.

Response:

The Draft EIS reads (page 46):

Approaches to Adaptive Management. Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. It involves monitoring practices to determine if they are meeting the set objectives, and facilitating changes to the management practices, if needed, to ensure the objectives are met. Adaptive management is based on the premise that managed ecosystems are complex and unpredictable, and therefore cannot be effectively managed within a rigid management context.

The process of adaptive management is vital for the success of this plan. Each of the alternatives for the shoreline and beach complex and the proposed actions for the foredune and dune complex employ an adaptive management element involving monitoring and evaluation. This means that although each alternative includes estimates as to the effectiveness of the restoration actions ultimately some of those actions could be modified over time as knowledge is gained through implementation. For example, the proposed beach nourishment program would be evaluated to determine its effectiveness over the course of the plan's life. Monitoring of the shoreline profile and near shore habitats would be conducted to ensure that park resources were not negatively impacted by the implementation of an alternative.

Adaptive management can best be defined as a process that "...involves the clear statement of objectives, the identification of management alternatives, predictions of management consequences, recognition of uncertainties, monitoring of resource responses, and learning (National Research Council 2004). Adaptive management can be seen as a process of structured decision making (Williams et al. 2007), with special emphasis on iterative decisions that take uncertainty and the potential for learning into account." (Williams, B. K., and E.D. Brown 2012; Adaptive Management: The U.S. Department of the Interior Applications Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.)

The comment on the draft EIS requests the information that would be provided for an adaptive management process. The plan does realize the only way to correct the issues identified in the purpose and need is through some sort of modification of the sediment delivery systems, directly by nourishment. The alternatives focus on nourishment with existing sources of sediment either through use of moderate amounts of material on a year-by-year basis, or by much larger amounts of material that would last a longer period. The new alternative, which is the reworking of existing alternatives, only changes the composition of the nourishment material, but the essential delivery of restoration materials is through nourishment. The solution that can be realized through this plan appears to be rather simple – replace the lost sediment.

Therefore, the adaptive approach the National Park Service will take here will be more of a conventional state-specific management approach rather than a strict adaptive management approach; our management approach in the draft EIS was incorrectly identified. The Departmental guidance defines this approach as involving an assumption "...that the objectives are appropriate, the resource system is fully observed and understood, and the resource models reflect full understanding. New data are used to track the system's current status; however, structural uncertainty and surprise are not accounted for in the assessment of management alternatives." Our management action will involve only two variables, the amount of supplemental nourishment to be placed into the system and the timing of those placements.

We have revised the discussion on page 46 of the Draft EIS.

REACHES 1 AND 2 PREFERRED ALTERNATIVE GENERAL QUESTIONS

Concern Statement:

Several commenters had concerns regarding the preferred alternative for reaches 1 and 2.

Response:

As described under the project area definition on page 32 of the draft EIS, man-made structures in and around the project are barriers to natural littoral drift causing areas of accretion in some sections and erosion in others. The Michigan City Harbor is a barrier to the littoral drift causing areas of erosion in reach 1.

The reaches were grouped because actions to address erosion in reach 1 would affect reach 2; likewise, actions to address erosion in reach 3 would affect reach 4. However, no specific restoration action is required to be taken in reaches 2 and 4 since they are defined as dynamically stable, yet they benefit from the proposed actions in reaches 1 and 3, respectively. The goal of the plan is to develop strategies that would support the reestablishment of more sustainable shoreline sediment movement and a more natural ecosystem of shoreline vegetation, foredune, and dune complexes. The National Park Service cannot control the lake, but can develop strategies to offset erosional forces that are presented as a result of man-made structures in and around the lake. The plan is designed to benefit the entire shoreline rather than specific sites.

PROPOSED MODIFICATION TO REACHES 3 AND 4 PREFERRED ALTERNATIVE

Concern Statement:

One commenter requested additional information on alternative D in reaches 3 and 4, and felt the level of detail for this alternative was insufficient to dismiss it.

Response:

Alternative D for reaches 3 and 4 is still conceptual and engineering design has not been completed; therefore, the exact locations and schematics of the lift stations are not depicted. Alternative D was not eliminated from consideration and was analyzed in detail. However, this alternative was not selected as the preferred alternative because estimated maintenance costs and considerations of jurisdictional authority in combination with the potential environmental benefit ranked this alternative below the selected preferred alternative.

CONSULTATION AND COORDINATION – GENERAL COMMENTS

Concern Statement:

Many commenters expressed the need for cooperation and consultation with partners (municipal, state, and federal as well as private industry) to resolve issues associated with successful shoreline management.

Response:

For the plan to be successful there would need to be continued cooperation between all stakeholders in the area. NPS staff will actively coordinate with all parties on an on-going basis and to consult with the various agencies that have permitting and/or regulatory responsibilities. However, despite the fact that each has its own interests and responsibilities, a successful plan to address the shoreline cannot happen without dialogue and interaction among all parties.

IMPACT ANALYSIS: GENERAL METHODOLOGY FOR ESTABLISHING IMPACTS / EFFECTS

Concern Statement:

A commenter expressed concern that not all relevant projects were considered as part of the cumulative impacts.

Response:

The cumulative analysis in the draft EIS lists the projects in the vicinity that the National Park Service is aware of, and includes non-NPS led projects. If there are specific projects provided to the National Park Service that should be included in the cumulative analysis, those will be incorporated in the final EIS.

IMPACT TOPICS DISMISSED FOR DETAILED ANALYSIS: WATER QUALITY

Concern Statement:

Commenters expressed concern that the preferred alternative in reaches 1 and 2 would have impacts on water quality; especially waterborne pathogens. Similarly there was concern that water quality was dismissed as an impact topic.

Response:

The alternatives in this plan have a very low probability of either improving or adversely affecting the water quality of Lake Michigan and was dismissed from further analysis. Nourishment material would be clean and free of contamination. As stated on page 28 in Chapter 1, the permitting conducted prior to dredging, sediment placement, and berm or bypass construction activities would identify mitigation required to protect against human health concerns. In coordination with IDNR, test criteria (which would include algae and bacteria that could potentially be harmful to the public) would be established prior to commencement of nourishment activities.

ISSUES: CLIMATE CHANGE

Concern Statement:

Several commenters expressed concern that the plan be able to consider and anticipate changes due to climate change.

Response:

Climate change is addressed under "Planning Issues and Impact Topics" on page 22 of the draft EIS. As stated in the text, "While it is well accepted that climate change is occurring, the rate and severity of impacts at the park is, as yet, undefined. Extreme weather events have historically been documented in the area of the park, specifically in 1998 and 2010. The anticipated increased frequency and intensity of storm events have the potential to exacerbate the loss of sediment along the shoreline, thereby accelerating the accumulation of sediment on accreting shoreline reaches. These likely future conditions add emphasis to the need for an effective, long-term, beach restoration plan." The plan has been developed under the assumption that the effects of climate change, including lake levels, would continue to affect the shoreline.

The 100-year storm event was selected as the design condition for the shoreline improvements as a design that could withstand a worst-case scenario. Utilizing the 100-year storm event as a design condition is appropriate given the anticipated increased frequency and intensity of storm events that could exacerbate the loss of sediment along the shoreline as a result of climate change. These likely future conditions add emphasis to the need for an effective, long-term, beach restoration plan.

Beaches are dynamic systems that depend on a constant source of sediment to maintain themselves even when lake levels are going down. Sediment is normally carried by long-shore currents that run parallel to the beach until it is dropped onto sand bars just offshore. In summer, these sandbars are slowly moved beachward by small waves until they reach the shoreline, expanding the beach. In winter, before lake ice forms, large storm waves erode the beach pulling some of the sediment back out into the lake. Even with lower lake levels, nourishment would continue to be required to replenish sediment loss due to storm events.

PLAN IMPLEMENTATION AND SIGNAL OF FUTURE INTENT: REMOVAL OF HARDENED STRUCTURES

Concern Statement:

Some commenters requested clarification regarding the existing hardened structures in the project area that could be considered for removal.

Response:

The text in Chapter 1 under "Proposed Plan for Implementation" (page 21) has been revised to "Reestablishment of more natural shoreline processes could eventually allow the current structures within the Indiana Dunes National Lakeshore boundaries along the lakeshore to be removed in the future without endangering the adjacent infrastructure."

Decisions on current structures to be removed would be addressed in the future through more detailed planning efforts. Part of Crescent Dune area is armored with sheet piling. Approximately 650 feet of the seawall at Crescent Dune has recently been acquired by the National Park Service. Changes to management of this area would also need to be considered as part of a more detailed planning effort.

PURPOSE AND NEED IS NOT VALID OR SUBSTANTIATED

Concern Statement:

A few commenters indicated that this plan is not likely to result in a solution, or that it is a solution looking for a problem.

Response:

Unfortunately, not all of the Lake Michigan beach grows larger with lower lake levels. Beaches are dynamic systems that depend on a constant source of sediment to maintain themselves even when lake levels are going down. Sediment is normally carried by long-shore currents that run parallel to the beach until it is dropped onto sand bars just offshore. In summer, these sandbars are slowly moved beachward by small waves until they reach the shoreline expanding the beach. In winter, before lake ice forms, large storm waves erode the beach pulling some of the sediment back out into the lake.

Due to the presence of various industrial and navigational structures along Lake Michigan's southern shore, the transport of sediment along the shoreline has been interrupted. This has resulted in areas of accretion, in which the beach appears to be increasing in size as more sediment becomes trapped, and areas of erosion, in which sediment is carried away from the shoreline and transported downdrift. Since it would not be feasible to remove or modify the harbor, the plan/draft EIS proposes alternatives that would create conditions that more closely mimic natural coastal processes in the presence of the functioning harbors.

As stated in the Summary, "The plan provides the National Park Service with comprehensive guidance for restoring natural shoreline processes, preserving shoreline ecosystems, and providing opportunities for quality visitor experiences at Indiana Dunes National Lakeshore. The intent of the plan/draft EIS is not to provide specific and detailed answers to every issue facing the park, but rather to provide a framework to assist National Park Service managers, stakeholders, and locals governing bodies in making decisions." There is no guarantee that issues with shoreline conditions would be fixed, but with the implementation of this plan, NPS managers would have guidance for addressing these issues.

COST OF IMPLEMENTING THE PROJECT IS PROHIBITIVE

Concern Statement:

The potential benefits of the project are not justified by the cost.

Response:

The NPS is responsible for protecting resources in parks unimpaired for future generations. In addition to protecting park resources this project would benefit other land owners around the park.

COMPLIANCE WITH FEDERAL, STATE, AND LOCAL LAW

Concern Statement:

Commenters asked whether the plan is consistent with the Lake Michigan Coastal Zone Management Act for Indiana.

Response:

The National Park Service reviewed the alternatives presented in the plan and determined the implementation of the alternatives would be consistent with the Coastal Zone Management Act. The National Park Service has worked closely with IDNR during the development of the plan and will continue into the future of the plan. The plan would complement the Lake Michigan Coastal Program for areas that are within NPS jurisdiction.

PARK LEGISLATION / AUTHORITY

Concern Statement:

Some questioned how the plan considered the issues of ownership, authority, and funding in the development of the alternatives.

Response:

The plan has been developed by the National Park Service to provide a framework to assist NPS managers, stakeholders, and local governing bodies in making informed decisions. As stated on page 3 of the draft EIS, the USACE is a cooperating agency on the plan/draft EIS and was included in the decision-making. The IDNR was invited to participate as a cooperating agency but declined (see the Introduction on page 3 and Appendix B on page 321 of the draft EIS). The National Park Service has actively engaged the public, stakeholders, and government officials at the federal, state, and local levels throughout the planning process.

The National Park Service acknowledges that in order for the plan to be effective, full implementation of the plan would have to be a cooperative effort between all stakeholders in the area.

Implementation of the plan is dependent upon available funding. However, development of the plan/draft EIS is the first step toward providing for a comprehensive guidance for restoring natural shoreline processes, preserving the shoreline ecosystem, and providing opportunities for quality visitor experiences at Indiana Dunes National Lakeshore.

PARK OPERATIONS: EFFECTS OF PROPOSAL AND ALTERNATIVES

Concern Statement:

The draft EIS states that impacts to park operations as a result of alternative D would result in minor to moderate, short- to long-term impacts. The U.S. Environmental Protection Agency (USEPA) recommends additional information on the required staff resources, expected maintenance, timing, and costs in relation to the sand bypass system, particularly how these impacts differ from the other alternatives to be included in the final EIS.

The USEPA requested additional information about the sand bypass system.

Response:

As stated in Chapter 4 on page 226 of the draft EIS, "following construction, the permanent bypass system would require monitoring and routine maintenance, adding to existing park staff workloads, resulting in minor to moderate, long-term, adverse impacts on park operations." The estimated cost would be $35.4 million (see Table 2-2A in Chapter 2 on page 58). In the event alternative D is chosen as the preferred alternative for reaches 1 and 2, timing of construction would be contingent upon available funding.

As noted on page 38 of the draft EIS, detailed design and compliance efforts would be necessary prior to implementation of any of the alternatives involving construction.

THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONCERN: IMPACT OF PROPOSAL AND ALTERNATIVES

Concern Statement:

One commenter asked whether the plan would impact piping plover habitat.

Response:

A summary of impacts on the piping plover habitat is provided in Chapter 4 under "Threatened and Endangered Species and Species of Concern" and is also summarized in Table 2-3, Alternatives Impacts Table, Reaches 1 and 2, and Table 2-4, Alternatives Impacts Table, Reaches 3 and 4. For all proposed alternatives, implementation of the proposed actions may affect, but is not likely to adversely affect, piping plover and their associated habitat.

As stated in Chapter 5, Consultation and Coordination, on page 243, the National Park Service contacted the U.S. Fish and Wildlife Service (FWS) in a letter dated July 2011. The letter advised the FWS of the National Park Service planning process for this plan/draft EIS and requested concurrence with a determination that the proposed project may affect, but is not likely to adversely affect endangered, threatened, and candidate species nor adversely modify piping plover critical habitat.

The FWS responded to the National Park Service's request in a letter dated August 8, 2011, and concurred with the National Park Service determination for special status species and critical habitat found within the proposed project area (which encompasses the shoreline of Lake Michigan between Michigan City in LaPorte County on the east, and the U.S. Steel breakwater in Gary in Lake County on the west). The Porter County shoreline of Lake Michigan is also included in the project area.

TERRESTRIAL HABITAT: IMPACT OF PROPOSAL AND ALTERNATIVES

Concern Statement:

Concerns were expressed about the placement of nourishment materials within the project area and the impact on terrestrial species; especially migratory shorebirds and state listed plants. It was suggested that placement of materials should be timed to minimize impacts on plants.

Response:

Activities associated with implementation of the plan, including nourishment, would be conducted in coordination with National Park Service wildlife biologists, and timed to reduce the impact to terrestrial species to the extent possible. Potential impacts to migratory shorebird habitat are not anticipated; however, further study would be conducted if warranted.

TERRESTRIAL MANAGEMENT PROPOSED ACTIONS

Concern Statement:

A number of comments were received related to the management of terrestrial resources in the project area including mitigation measures. A commenter requested a definition of the term "social trails" and which trails would be closed. Another commenter inquired how the NPS would ensure that contractors are following guidelines to prevent the spread of invasive plant species during implementation of the plan and how mitigation measures for topsoil would be used to prevent the spread of invasive plant species.

Response:

The specific social trails (paths created as a consequence of foot traffic, or the results of unplanned and undirected regular foot traffic) to be reduced have not been specifically identified. NPS management and resource staff would evaluate social trails on a case-by-case basis and identify those that are accelerating erosion and habitat degradation.

NPS staff would monitor contracts to ensure compliance with guidelines outlined within the plan. Terrestrial management guidelines within the draft EIS are specific to areas within the Indiana Dunes National Lakeshore boundaries.

The disturbed terrestrial environment from beach nourishment is primarily the shoreline/Beach. This area is predominantly sandy and has no organic layer (topsoil) and as such is not conducive to spreading invasive plant species as they will not sprout on the nutrient poor sand.

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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